Testing the Effectiveness of Interdisciplinary Curriculum-Based Multicultural Education on Tolerance and Critical Thinking Skill

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Abstract: This research aims to explore the effectiveness of interdisciplinary education program based on multicultural education on the tolerance value, attitude and critical thinking skills of the fourth grade primary school students. Single group pre-posttest design has been used in the study. The research has been carried out with 30 fourth-grade students, at a primary school located within the district of Karakocan in Elazig during the 2015-2016 academic year. Among the participants, 15 are females and 15 are males. The research has employed Tolerance Attitude Scale developed by Kaptan-Yarar, tolerance value and critical thinking story tests and scoring rubrics. Descriptive statistics and dependent samples t-test have been used during data analysis. Research results have revealed a statistically significant difference between critical thinking scoring rubric, tolerance value scoring rubric and tolerance attitude scale pretest-posttest scores in favor of posttest. Based on these results, it can be said that the interdisciplinary curriculum developed based on multicultural education improves students' critical thinking skills, tolerance value and attitudes.

Keywords: *Multiculturalism, multicultural education, tolerance, critical thinking.*

Introduction

In the present circumstances, pluralism has become an almost natural structure of the societies in which we live. With the increasing role of transnational institutions arising from the social transformations brought about by globalization and the emerging multiple identities, differentiated identities have been deemed as the reality of the world. Today, people live together more than ever before and most countries display culturally significant variations. This paves way for the emergence of the concept of multiculturalism.

Multiculturalism, in an absolute sense, is the recognition of race, ethnicity, language, sexual orientation, gender, age, disability, class status, education, religious orientation and other cultural dimensions (American Psychological Association [APA], 2002). Ergin (2000) defines multiculturalism as "*the preservation of different cultures or cultural identities as a single nation or a state in a unified society*". Multicultural societies host people who think differently, who dress differently and who have different customs and traditions (Davies, 2010). It would be beneficial to be acquainted with these different cultures so that all these differences can be more easily welcomed and accepted. Multicultural education plays a significant role at this point. Integrating information about different cultures, introducing different cultures into the curriculum can help to solve the problems caused by cultural differences. Banks et al. (2001) have defined multicultural education as "an idea, an educational reform and a process that seek to create equal educational opportunities for all students including those from different racial, ethnic and socio-class groups and that strive to change and restructure the total school environment". Gay (1994) has indicated that multicultural education is "an educational policy that aims to change the total structure of educational institutions in order that students can have equal academic opportunities". With a view to providing multicultural education, teaching programs must be in tune with this education. It is of great significance for teachers to consider students' biological, sexual, racial, religious, cultural, economic, political differences as natural, to take all these into consideration while regulating the teaching environment and to evaluate such differences as wealth rather than problems (Basbay & Bektas, 2009; Basbay & Kagnici, 2011; Cirik, 2008; Coban, Kahraman & Dogan, 2010; Polat 2009). In this regard, the organization of learning environment based on interdisciplinary approach by teachers in a multicultural classroom environment will not only

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contribute to the students' learning but also enable students to reckon cultural differences in their environment as richness.

The interdisciplinary teaching approach is gaining new meaning in different ways by various scientists. Yildirim (1996) has introduced the *interdisciplinary* approach as "the considerable demonstration of traditional subject areas through constituting a meaningful whole of specific concepts", while Aydin and Balim (2005) have defined it as "the integration of a concept with relevant fields and skills which can shed light on different aspects of this concept through using a certain concept, problem or subject as base". An interdisciplinary teaching approach makes it easier to look at an event, the situation from different disciplines, to understand the event and to detect solutions to the problems. Therefore, it is highly prominent to apply interdisciplinary teaching approach to the teaching-learning process in order to recognize and understand a variety of cultures as well as solving problems arising from cultural differences in multicultural societies. Because it is agreeable for the students to be familiar with different cultures and to find solutions to the problems with different perspectives. Indeed, Banks (2013) has stated that multicultural education is interdisciplinary.

One of the substantial elements of culture is the values. Value refers to all kinds of ideological or divine thoughts, ideas, behaviors, rules or assets that are accepted, adopted and maintained as a whole among societies, beliefs, ideologies or people (Donmez & Yazici, 2008). In other words, value is a tendency to prefer a particular situation to another (Genc & Eryaman, 2007). Today, the values and lifestyle of contemporary people undergo rapid changes due to the fact that rapid change in science and technology has become one of the most essential parts of our daily life (Yagci, 2008). At that point, it is paramount in urging individuals to gain values in order to keep up with this change since bringing individuals in gaining the most important moral and civil values such as respect, love, tolerance, responsibility, virtue, courage, faith, perseverance, justice, and individual discipline will make a great contribution to the formation of a democratic society. In fact, Doganay, Seggie and Caner (2012) have drawn attention to the fact that values are an inseparable part of democratic citizenship education, touching on the importance of gaining values in terms of the formation of a democratic society. Besides, multicultural education presents students a variety of values such as respect for differences, justice, tolerance, love, and respect. Multicultural education pursues to raise democratic individuals (Banks, 2013; Gay, 2004; Wilson, 2012). Thus, designing and implementing the curriculum based on multicultural education can foster students to gain respect for differences, justice, tolerance, love, and respect.

Critical thinking is based on reaching conclusions based on sound evidence and reasons (Paul & Elder, 2012). Duphorne (2005) defines critical thinking as "an environment which necessisates to include a variety of opportunities and ideas, analysis and applications for the purpose of supporting value judgments and organizing ideas". One of the most significant factors affecting an individual's critical thinking skill is the culture of the society in which s/he was born and grew up, and hence her/ his personality is formed. Each society has its own understanding of tradition, custom and social norms, namely, culture. Individuals learn the culture of society they live in during the process of socialization and strive for maintaining the existence of the society by transferring it to the other generations (Tumkaya & Aybek, 2008). While transferring cultural elements to individuals, the thinking skills of that community are also conveyed. In this respect, it is likely that the critical thinking skills of the individuals living in multicultural societies are influenced by the cultural characteristics of society. Bigatti et al. (2012) have clearly stated that multicultural education facilitates students' critical thinking skills. Hohensee, Bission and Derman-Sparks (1992) have noted that one of the aims of multicultural education is to provide critical thinking skills regarding prejudices against cultural differences. Bohn and Sleeter (2000) have stated that multicultural education ensures critical thinking environment in schools.

Upon analyzing the relevant literature, a wide variety of studies have been conducted on multicultural education. In reality, more than 4,000 articles have been found as a result of the search made for the last ten years related to multicultural education in the ERIC database. A limited number of studies regarding multicultural education are available in Turkey (Akin, 2016; Basarir, Sari & Cetin, 2014; Demir & Basarir, 2013; Engin & Genc, 2015; Marangoz, Aydin & Adiguzel, 2015; Polat, 2009; Polat & Kilic, 2013; Unlu & Orten, 2013; Yavuz & Anil, 2010; Yazici, Basol & Toprak, 2009). These studies have mostly explored the attitudes and perceptions of teachers and prospective teachers towards multicultural education. The studies conducted in Turkey have been identified to mainly concentrate on teachers and prospective teachers, which has been considered as a shortcoming by the researchers. It is of highly significant to include multicultural education practices in our country which has a multicultural structure. The use of different disciplines related to multiculturalism will contribute to the students' learning. Therefore, it is considered appropriate to use interdisciplinary teaching approach in multicultural education since students are expected to understand and assimilate the concept of multiculturalism, learn from this point of view by establishing relations with different disciplines from different perspectives and in this way they will see each other's differences as richness thanks to the interdisciplinary teaching approach. Moreover, enquiring into the problems of multiculturalism from different perspectives will be instrumental in the solution of these problems.

By virtue of the interdisciplinary education program that will be developed based on multicultural education, the notion of providing students with the value of tolerance and critical thinking skill will be accomplished. Given the relevant national and international literature, no such a study has been published specifically on examining the process of improving the value of tolerance and critical thinking skill in students through the interdisciplinary curriculum developed on the basis of multicultural education. Besides, a great number of studies conducted on multicultural

education in Turkey have mostly used quantitative research design (Aktoprak, Yigit & Guneyli, 2017; Akyildiz, 2018; Basbay, Kagnici & Basbay, 2018). Depending on all these reasons, such a study has been conducted in hope that will contribute to the relevant literature. This research aims to explore the effectiveness of interdisciplinary education program based on multicultural education on the tolerance value, attitude and critical thinking skills of the fourth-grade primary school students. Considering the discussion made above, the following questions have been sought in compliance with the purpose of the study:

1. Is there a statistically significant difference between the critical thinking skill scoring rubric pre-test and post-test scores of the fourth-grade students receiving interdisciplinary education program based on multicultural education?
2. Is there a statistically significant difference between the tolerance value scoring rubric pre-test and post-test scores of the fourth-grade students receiving interdisciplinary education program based on multicultural education?
3. Is there a statistically significant difference between the tolerance attitude scale scoring rubric pre-test and post-test scores of the fourth-grade students receiving interdisciplinary education program based on multicultural education?

Method

Research Design

Experimental research model, which is a variety of quantitative research models, was used in the study. This research has utilized the *quasi-experimental design*, one of the experimental designs. Quasi-experimental design is a research design that involves experimental approach without any random pre-selection processes (Robson & McCartan, 2016). Quasi-experimental design requires the purposive selection of the research sample (Sonmez & Alacapinar, 2018). Single group pre-posttest design was used in the study. This design refers to only one group and pre-test and post-test are performed (Gurbuz & Sahin, 2015). The experimental design of the research is shown in the table below.

Table 1. Experimental design

Group	Pretest	Application	Postest
Experimental group	Tolerance attitude scale, critical thinking skill and tolerance scoring rubric	Interdisciplinary Curriculum-Based Multicultural Education	Tolerance attitude scale, critical thinking skill and tolerance scoring rubric

Research Sample

The research has been carried out with 30 fourth-grade students who study at a primary school located within the district of Karakocan in Elazig during the 2015-2016 academic year. Among the participants, 15 are females and 15 are males. *Criterion sampling method* has been used in the research. The basic understanding of the criterion sampling method involves selecting cases that meet a predetermined set of criteria. The above-mentioned criterion or criteria may be created by the researchers or a previously prepared criteria list can be used (Yildirim & Simsek, 2011). This research holds some criteria including the participants have different socio-economic levels and that students with different cultural characteristics study in the same class. The students of the study group are members of different ethnicities (Kurdish, Turkish, Zaza), they speak different languages in their homes (Turkish, Zazaki, Kurdish) and they belong to different beliefs (Alevi, Sunni). In this respect, it can be said that the working group has a multicultural structure. The working group did not receive any lessons based on multicultural education before. The reason for the determination of these criteria is that reasonable results will be achieved after the implementation of the teaching program.

The Implementation of Interdisciplinary Curriculum

The implementation has been conducted with the 4th-grade students studying at a state school in Karakocan district of Elazig province during the fall semester of the 2015-2016 academic year. An interdisciplinary curriculum based on multicultural education was prepared and implemented to the students. The themes were determined by taking the definition of multiculturalism by APA (2002) and the characteristics of fourth-grade primary school students. These themes include; "Individual and Society, Gender, Ethnic Identity and Genealogy, Language, Faith, Socio-Economic Situation, Disability". The theme of individual and society involves the activities through which individuals learn their cultural characteristics and cultural characteristics of other individuals living in the vicinity. They were asked to explore the myths and tales of their own cultures and different cultures as well as presenting them in the class. In addition, a discussion was initiated for which we should respect and tolerate people who have different cultural characteristics through value line activity. They were ensured to design a unique poster by using visual art techniques related to its own culture and characteristics of different cultures (tradition, custom, clothes, games etc.). The theme of gender includes activities on creating column charts for the numbers of women and men around them and to present

these graphs. They were asked to conduct a group study research on the problems related to violence against women in their environment.

The students were asked to write a slogan for the prevention of violence against women, and they were also asked to draw pictures related to the problem in the visual arts course. They were asked to share their ideas about how to prevent violence against women through using brainstorming technique. In addition, women and men were taught in English, and they were asked to make a poster about violence against women in English and to prepare drama about violence against women. In the theme of language; different languages were introduced to the students and the point that 'each language is important and valuable' was emphasized. Activities have been carried out on greetings in different languages. Folk songs and songs from different languages were sung. In the theme of disability; activities were conducted on how to respect and love people with disabilities. The wheelchair for disabled people was brought to the classroom and students were informed about the problems the disabled individuals encounter through using learning by doing. Short films about the problems of the disadvantaged people were watched, and they were asked to express their ideas on this issue. Students were also asked to write poems and stories related to the problems of disadvantaged people. By providing a discussion method, students were provided with the opportunity to develop various recommendations to the problems of disadvantaged people. Afterward, they were asked to do research on the disadvantaged people's achievements in art, sports, etc. and make presentations in class. In addition, they were asked to draw pictures in the visual arts class about the problems of the disadvantaged people.

In the theme of faith; students were informed about the fact that there are people with different beliefs within the environment they live. Various activities were performed related to respect and tolerance toward individuals with different beliefs. Short films about different beliefs were demonstrated and they were asked to prepare for drama. They were asked to search the songs regarding different beliefs around them and to voice them in the class. In the theme of socio-economic status; students were explained that they may encounter with individuals with different socio-economic status in their environment, which is natural. The value line activity was applied for students to be respectful towards these differences. Students have been asked to write stories and poems, to make paintings and to write songs with about people's problems with different socio-economic status. The students were asked to prepare role-plays about the problems that people with different socio-economic status have in their environment.

The activities based on the interdisciplinary teaching approach were presented to five faculty members, two classroom teachers, one Turkish language teacher, one English teacher, one social studies teacher, one mathematics teacher, one music teacher, one religious culture teacher, one physical education teacher. In line with the faculty members' and teachers' views, the necessary arrangements were made. The implementation lasted 12 weeks in total. After the activities were implemented, the students were interviewed so as to ask their views about the activities. The acquisition, content and teaching-learning process dimensions of the interdisciplinary education program, which is based on multicultural education, have been integrated with eight disciplines. Figure 8 depicts the eight disciplines:
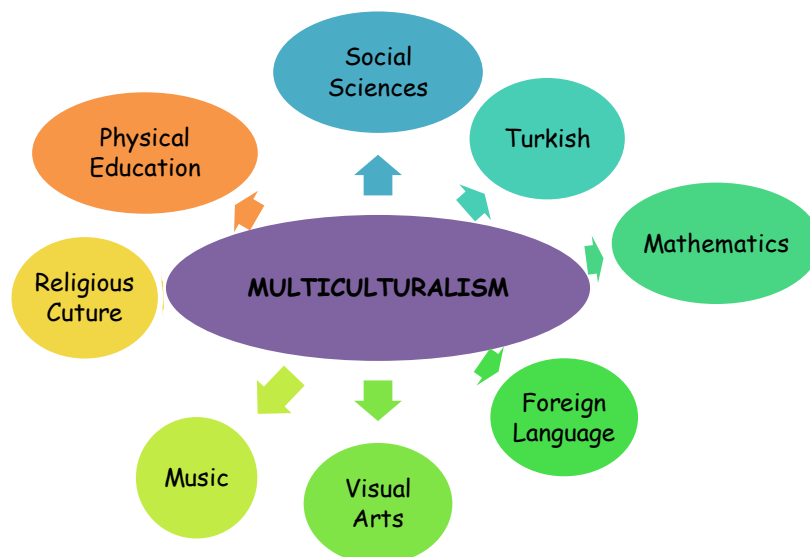

Figure 1. Interdisciplinary components of multiculturalism

Data Collection Tools

The research has deployed three data collection tools as follows:

Tolerance Attitude Scale: This research has employed *Tolerance Attitude Scale* developed by Kaptan-Yarar (2015). The scale has been administered to 200 students in the fourth-grade primary school students in groups within one-course hour (Kaptan-Yarar, 2015). The sub-dimensions of the scale are "*respect for thoughts*", "*being understanding*", "*love*" and "*respect for emotions*". The internal consistency coefficient Cronbach's alpha reliability coefficient has been found to be 0.87 for the overall scale. For the sub-dimensions—respect for thoughts, being understanding, love, respect for emotions—the coefficients have been determined to be 0.80, 0.78, 0.73, 0.63, respectively. As a result of the analyzes, being a 3-Likert type ("I totally agree", "I agree partially" and "I don't agree"), a 21-item scale has been obtained (Kaptan-Yarar, 2015). While the lowest score obtained from the scale is 21, while the highest score is 63. After obtaining the necessary permission by the researchers, the scale has been used within the scope of the research. The total scale's Cronbach alpha reliability coefficient has been re-calculated and determined to be 0.94 in the present study. Secer (2015) has implied that the Cronbach Alpha coefficient should be .70 and over. Based on this reference, the scale can be considered as reliable.

Determining the Tolerance Value and Critical Thinking Skills through Story Test: Critical thinking skill and tolerance value story test have been developed and administered to be used as pre-test and post-test. In the stage of writing the stories prepared by the researchers, content, and language-expression aspects have been required to be examined. Oztoprak (2006) has noted the following criteria that are taken into consideration in order to determine the stories to be used by the teachers: Sentence length, meaning of words, syntax of the story, length of story, plot, theme, conflict, point of view, setting, time, characters, type of story (event/situation), author's understanding of art, features of the period and level of interest. Great importance was attached to these criteria in the story tests prepared by the researchers. In a study conducted by Solar (2012) with a view to exploring the relativity of the child towards the heroes of the narrative texts and their suitability for the reality of the child, the child has been found to establishes a relationship between the subjects, events, heroes and daily life. That the story tests are in accordance with the levels of the fourth-grade students in primary school is taken into consideration. Besides, the heroes of the stories were noted to be chosen from the people that students could meet in their daily lives. Sever (2013) has indicated that the quality of the social and cultural environment in which the hero lives should be tested. The researchers of the present study have paid great attention to the appropriateness of the stories to the social and cultural environment in which students live. Therefore, the names of heroes, spoken language, heroes' ways of living and beliefs were chosen from the environment that students are familiar with. The stories prepared by the researchers were presented to the five faculty members, five classroom teachers and two Turkish teachers who were experts in their fields, and the required corrections were made in the stories. There are six open-ended questions in the critical thinking skill story test and three open-ended questions in the tolerance value story test. In the development of the questions, the opinion of six field experts was sought.

Critical Thinking Skill and Tolerance Scoring Rubric: This research has also deployed *Rubric* developed by the researchers in order to measure critical thinking skill and tolerance. Rubric is to evaluate the expected student performance by dividing into different dimensions and levels at the end of a certain teaching process (Sezer, 2005). Haladayna (1997) has defined rubric as an assessment tool that allows us to record our observations to the corresponding dimension among the categories determined with scores (criterion or criteria). Upon analyzing the related literature, two different rubrics have been found, namely the holistic and analytic. An analytic rubric has been selected for this study. An analytic rubric is a measurement tool that allows us to record the scores of the observations in accordance with the defined categories separately (criteria or criteria) (Haladyna, 1997). The analytic rubric has been prepared through following the stages proposed by Goodrich (2001): "*listing the criteria to be used in determining performance, deciding which type of Rubric will be used as a scoring strategy, determining what the performance levels should be and providing descriptions for each level and asking for expert opinion".* Critical thinking skill consists of six dimensions and is prepared in three levels. The tolerance value rubric is composed of three dimensions and is prepared on a triple level. In both rubrics, it was shown to six field experts and their opinions were taken. In addition, 54 primary school students were applied and the Kendall Coefficient of Coefficient was taken into consideration. In the results of the analyzes, Kendall's adaptation coefficient of critical thinking skill was found to be .80, and Kendall's adaptation coefficient of tolerance value was found to be .88. Based on all these results, it can be said that both rubrics developed are valid and reliable.

Data Analysis

First, the study has confirmed whether data provided the general requirements of the parametric tests. The normal distribution of data is highly significant to determine which analysis technique will be used (Secer, 2015). In order to examine the normal distribution, it is recommended to examine "Skewness and Kurtosis, Kolmogorov-Smirnov, Shapiro Wilks, Histogram, Q-Q Graph, P-P Graph" tests (Cicek, 2014; Guris & Astar, 2014; Pallant, 2010; Secer, 2015). Buyukozturk (2011) and Secer (2015) have suggested that the sample should be maximum 50 so as to use the Shapiro-Wilks test. Based on these references, whether data demonstrated normal distribution has been examined through the

use of Shapiro-Wilks test since the research sample holds 30 students in total. As a result of the analyses, the data demonstrated normal distribution. Parametric tests are used when the normal distribution is ensured. This research has used dependent samples t-test, one of the parametric tests, in order to examine the significant difference between descriptive statistics and pretest-posttests. Can (2014) has mentioned that the effect size should be given in t-test analysis. Therefore, the effect size has been calculated and presented in the related tables. Green and Salkind (2013) have reported that the effect size in t-test is found by calculating the mean difference between two groups, and then dividing the result by the pooled standard deviation. Hence, effect sizes have been calculated and displayed in tables. According to Green and Salkind (2013), if *d* is over 1, it is considered to be very large, .8 is large, .5 is medium and .2 is a low effect.

Findings

The research findings have been presented based on the research questions.

1. Findings related to the First Research Question

The first research question has been determined as such: "*Is there a statistically significant difference between the critical thinking skill scoring rubric pre-test and post-test scores of the fourth-grade students receiving* interdisciplinary *education program based on multicultural education?*". In this regard, the question whether there is a significant difference between the critical thinking skill scoring rubric pre-test and post-test scores of the students has been analyzed. The dependent samples t-test results are presented in Table 2.

Table 2. t-Test results of critical thinking skills scoring rubric pretest-posttest scores

Test	N	x̄	SD	t	p	*d*
Pretest	30	8.57	1.25	-22.197	.000*	4.05
Posttest	30	14.54	1.98			

*p < .05

Table 2 depicts the pretest $\overline{X}$ = 8.57 and posttest $\overline{X}$ = 14.54 mean scores related to critical thinking skill scoring rubric. As a result of the dependent samples t-test analysis conducted to test whether there is a statistically significant difference between the critical thinking skills scoring rubric pre-test and post-test scores of the students (t=-22.197, p<.05), a statistically significant difference has been identified in favor of posttest scores. The effect size (*d*=4.05) indicates that this difference is very large.

2. Findings related to the Second Research Question

The second research question has been identified as such: "*Is there a statistically significant difference between the tolerance value scoring rubric pre-test and post-test scores of the fourth-grade students receiving interdisciplinary education program based on multicultural education?*". In this respect, this research has examined whether there is a significant difference between the tolerance scoring rubric pre-test and post-test scores of the students. The dependent samples t-test results are displayed in Table 3.

Table 3. t-Test results of tolerance value scoring rubric pretest-posttest scores

Test	N	x̄	SD	t	p	*d*
Pretest	30	3.57	.50	-42,489	.000*	7.82
Posttest	30	7.93	.69			

*p < .05

As is seen in Table 3, the pretest and posttest mean scores related to tolerance scoring rubric are $\overline{X}$ = 3.57 and $\overline{X}$ = 7.93, respectively. The dependent samples t-test analysis conducted to test whether there is a statistically significant difference between the tolerance scoring rubric pre-test and post-test *scores* of the students (t=-42.489, p<.05) has noted a statistically significant difference in favor of posttest scores. The effect size (*d*=7.82) shows that this difference is very large.

3. Findings related to the Third Research Question

The third research question has been determined as follows: "*Is there a statistically significant difference between the tolerance attitude scale scoring rubric pre-test and post-test scores of the fourth-grade students receiving interdisciplinary education program based on multicultural education?*". To that end, this research has sought whether there is a significant difference between the tolerance attitude scale pre-test and post-test scores of the students. The dependent samples t-test results are depicted in Table 4.

Table 4. t-test results of tolerance attitude scale pretest-posttest scores

Attitude	Test	N	x̄	SD	t	p	*d*
Respect for Thoughts	Pretest	30	2.56	.22	-9.825	**.000***	1.79
	Posttest	30	2.92	.04			
Being Understanding	Pretest	30	2.82	.25	-3.477	**.002***	.63
	Posttest	30	2.99	.01			
Love	Pretest	30	2.68	.41	-3.753	**.001***	.69
	Posttest	30	2.98	.04			
Respect for Emotions	Pretest	30	2.20	.38	-7.792	**.000***	1.42
	Posttest	30	2.65	.12			
Total	Pretest	30	2.76	.11	-5.753	**.000***	1.05
	Posttest	30	2.89	.03			

*p < .05

Upon analyzing Table 4, the students' pretest mean score related to respect for thoughts dimension has been identified to be at "*agree*" level ($\overline{X}$ = 2.56), and pretest mean score is at "*agree*" level ($\overline{X}$ = 2.92); pretest mean score related to being understanding dimension is at "*agree*" level ($\overline{X}$ = 2.82), and that of the posttest mean score is at "*agree*" level ($\overline{X}$ = 2.99); pretest mean score related to love dimension is at "*agree*" level ($\overline{X}$ = 2.68) while the posttest mean score is at "*agree*" level ($\overline{X}$ = 2.98); pretest mean score related to respect for emotions dimension is at "partially *agree*" level ($\overline{X}$ = 2.20) while the posttest mean score is at "*agree*" level ($\overline{X}$ = 2.65); pretest mean score related to the overall scale is at "*agree*" level ($\overline{X}$ = 2.76), and the posttest mean score is at "*agree*" level ($\overline{X}$ = 2.89). The dependent samples t-test analysis conducted to test whether there is a statistically significant difference between the tolerance attitude scale pre-test and post-test scores of the students has shown a statistically significant difference across respect for thoughts (t=-9.825, p<.05), being understanding (t=-3.477, p<.05), love (t=-3.753, p<.05), respect for emotions (t=-7.792, p<.05) and the overall scale (t=-5.753, p<.05) in favor of posttest scores. The effect size shows that this difference is very large in terms of respect for thoughts (*d*=1.79), respect for emotions (*d*= 1.42) and the overall scale (*d*= 1.05); whereas the difference has been found to have medium effect in terms of being understanding (*d*= .63) and love (*d*= .69) dimensions.

Discussion, Result and Recommendations

As a result of the t-test analysis conducted to test whether there is a statistically significant difference between the critical thinking skills scoring rubric pre-test and post-test scores of the students, a statistically significant difference has been identified in favor of posttest scores. The effect size indicates that this difference is very large. These values have suggested that the difference between the participants' critical thinking skills scoring rubric pre-test and post-test mean scores is significant; moreover, the multidisciplinary education program based on multicultural education can be said to be highly effective on students' critical thinking skills. Critical thinking is not a random intellectual activity, rather it is a way of thinking that gets to the root of the problems, that examines them with different perspectives and that tries to understand and, if necessary, opposes them (Aybek, 2010). Chance has defined critical thinking as "analyzing facts, producing thoughts and organizing them, defending views, making comparisons and inferences, evaluating argumentations and an ability to solve problems" (Cited in Sahinel, 2002). The research results have unearthed that a significant difference between the students' critical thinking skill scoring rubric pre-test and post-test scores contributes to the students' critical thinking skill development through interdisciplinary curriculum developed based on multicultural education. As a result of the activities, students can be expressed to learn how to see the events and situations with different perspectives, how to make an inference, how to get to the core of the problems they encounter, how to understand and analyze the events and how to defend their views as well as having problem-solving skills. Indeed, multicultural education aims to have individuals gain different perspectives (Banks, 2013; Gay, 2004; Wilson, 2012). In their studies, Au and Kawakami (1994), Foster (1995), Hollins (1996) Gay (2010), Gunay, Kaya and Aydin (2014), Ladson-Billings (1994; 1995), Marangoz (2014) and Ware (2006) have found that multicultural education develops critical thinking skills. These results are in line with those of this research. Mathison and Freeman (1997) have concluded that the design with the interdisciplinary approach is effective in the development of critical thinking skills. In Elliot's (1999) study, the the interdisciplinary approach-based themes which are designed to combine mathematics and science courses were applied throughout a semester. The research results have revealed that the interdisciplinary approach contributes to the students' critical thinking skills. Besides, Diker (2003) has determined that interdisciplinary approach increases the students' logical thinking levels. In a study conducted by Powers and Jones-Walker (2005), the interdisciplinary approach has been applied to the faculty of pharmacy students in three sections over a period of time. The results have suggested that the interdisciplinary approach has an impact on students' problem solving and critical thinking skills development. In the thesis study conducted by Coskun (2009), the

activities based on interdisciplinary teaching approach have been determined to increase students' critical thinking dispositions. All these studies support the results of the present study.

Research results have revealed a statistically significant difference between the students' critical thinking skill scoring rubric pre-test and post-test scores. This may be due to the discussions within the scope of activities in the interdisciplinary education program based on multicultural education, having cooperative learning, subject-based teaching of critical thinking skills and conducting the course through research, orientation, question-answer technique, taking the students' views on all subjects and the active participation of the students, student-based activities, and ensuring that each student makes a number of products. Yaman (2014), in his dissertation, has reported that students' critical thinking skills significantly vary across brain-based teaching activities. Tonus (2012) has found that argumentation-based activities have an effect on students' critical thinking skills. Likewise, in the study conducted by Ozkok (2004), interdisciplinary teaching approach has been determined to be significantly effective in the critical thinking skills of the 7th-grade students. These results are in parallel to those of this research.

As a result of t-test analysis conducted to test whether there is a statistically significant difference between the tolerance scoring rubric pre-test and post-test scores of the students, a statistically significant difference has been noted in favor of posttest scores. The effect size shows that this difference is very large. These values have suggested that the difference between the participants' tolerance value scoring rubric pre-test and post-test mean scores is significant; moreover, the multidisciplinary education program based on multicultural education can be said to be highly effective on students' tolerance. Tolerance is the belief that refers to be understanding, respectful, welcoming different views, being tolerant towards people's different thoughts, beliefs, values system, etc. and non-interference in people's behaviors or actions they do not approve (Aslan, 2001; Ashford, 2009).

One of the main functions of education is to strengthen understanding, tolerance, and friendship among all nations, races and religious communities. Multicultural education is emphasized to have an effort to provide students with respect for racial, cultural and religious differences, and thus a democratic education approach can be achieved (Adamou, 2003; Quezada & Romo, 2004). With his view that "*Multiculturalism becomes meaningful as a way of thinking that operates with the principle of cultural pluralism and modeled on the principles of freedom, tolerance, and respect for individual differences in contrast to being a phenomenon defining social reality*", Vatandas (2008, p. 19) has indicated that multiculturalism is based on the principles of freedom, tolerance, and respect for differences. When people start to welcome different cultures with tolerance and when they begin to see the riches in them, they try to recognize the differences in their own cultures and reveal them instead of suppressing them (Giddens, 2000). Tolerance is one of the basic values that every citizen must have for the development of democracy and human rights in democratic societies (Colesante & Biggs, 1999; Weidenfeld, 2002; Widmalm, 2005). A significant difference between the students' tolerance value scoring rubric pre-test and post-test scores has revealed that the students develop the value of tolerance thanks to the multidisciplinary curriculum developed based on multicultural education. The activities conducted within the scope of the study have paved the way for the fact that the students have learned to be tolerant towards people with different ethnic groups, beliefs, different languages, disabilities, and socio-economic levels.

The inclusion of discussion method, cooperative learning, watching movies, role-play, story writing and conducting a variety of student-centered activities within the framework of the activities included in the interdisciplinary education program based on multicultural education is thought to result in a significant difference between the students' tolerance value scoring rubric pre-test and post-test scores. Iscan-Demirhan and Senemoglu (2009) have found that the students' levels of acquiring cognitive behaviors in the experimental group that the values education program was applied have been found to be significantly higher compared to the control group students. In the research conducted by Aladag (2009), values teaching approach in the social studies lesson have been found to create a significant difference in the cognitive levels of the students regarding their responsibility values. Similarly, the study carried out by Ozyurt, Demir and Bay (2015) has put forward that the value education program developed with the school-based approach is effective in providing the third and fourth-grade students with gaining the value of being determined. The results of these studies support those of this research.

The students' pretest and posttest mean score related to respect for thoughts dimension has been identified to be at "*agree*" level; pretest and posttest mean score related to being understanding dimension is at "*agree*" level, and; pretest and posttest mean score related to love dimension is at "*agree*" level; pretest mean score related to respect for emotions dimension is at "partially *agree*" level, while the posttest mean score is at "*agree*" level; pretest and posttest mean score related to the overall scale is at "*agree*" level. The t-test analysis conducted to test whether there is a statistically significant difference between the tolerance attitude scale pre-test and post-test scores of the students has shown a statistically significant difference across respect for thoughts, being understanding, love, respect for emotions and the overall scale in favor of posttest scores. The effect size shows that this difference is very large in terms of respect for thoughts, respect for emotions and the overall scale; whereas the difference has been found to have medium effect in terms of being understanding and love dimensions. These values have suggested that the difference between the participants' tolerance attitude scale pre-test and post-test mean scores is significant; moreover, the multidisciplinary education program based on multicultural education can be said to be highly effective on students' tolerance attitudes. In their study, Kaptan-Yarar (2015) has indicated that computer-aided activities based on a mixed

approach lead to a significant difference among the students' tolerance attitudes. This result supports that of this current study. Similar results have emerged in the study conducted by Aktepe (2010). He has performed an activity-based teaching of the charity value and found that the attitude scores of the students in the experimental group are higher than those in the control group. Tahiroglu (2014) aims to determine the effects of activities such as "*Respect and Tolerance towards Emotions and Thoughts" and "A Democratic Class Society*" on the dispositions and democratic attitudes of the primary school 4th grade students. The results of the present study have depicted significant differences in favor of experimental group across democratic attitude and tolerance levels of the students.

Based on the research findings, various recommendations have been developed:

1. Research results have suggested that interdisciplinary education program based on multicultural education has an effect on students' critical thinking skills. The organization of the activities based on multicultural education and interdisciplinary teaching approach in the teaching-learning environment by teachers may contribute to the development of students' critical thinking skills.
2. Research results have displayed that interdisciplinary education program based on multicultural education has an effect on students' tolerance and attitude. Therefore, the implementation of activities based on multicultural education and interdisciplinary education in the teaching-learning environment may contribute to the development of tolerance and other values. Besides, student-centered activities should be carried out during multicultural education. In this way, it will contribute to the development of the tolerance value of students as well as a positive development in the tolerance of the students.
3. The research has tried to develop the value of tolerance and critical thinking skills of the 4th grade students. Further research on different values and skills at different grade levels will contribute to the literature.

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