EJAES

JOURNAL OF ADVANCED EDUCATION STUDIES

İleri Eğitim Çalışmaları Dergisi

6 (1): 170-199, 2024

EXAMINING TEACHING WITH DESIGN-ORIENTED THINKING APPROACH IN TERMS OF DIFFERENT VARIABLES

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Geliş Tarihi/Received: 20.05.2024 Elektronik Yayın / Online Published: 25.06.2024
DOI: 10.48166/ejaes.1487147

ABSTRACT

This mixed-methods study aimed to investigate the effect of the design thinking approach on vocabulary learning achievement, cooperative learning, and problem-solving skills of secondary school students in English language teaching. The research was conducted with 43 students studying in the 8th grade at a secondary school located in Turkey during the fall semester of 2020–2021. During the implementation process, the effect of the design thinking approach on the vocabulary learning achievement, cooperative learning perception, and problem-solving skills of the experimental group students was investigated. In the control group, all practices were the same except for the design thinking approach due to controlling for the dependent variables with the blended learning method. Qualitative data were used to support the quantitative data obtained. Measurement tools developed by the researchers were used to collect the quantitative data, and interview questions were prepared to collect the qualitative data from the students. As a result, the design thinking approach indicated a significant difference in favor of the experimental group in terms of students' vocabulary learning achievement, cooperative learning perception, and problem-solving skills and had a positive effect on students.

Keywords: Design thinking-based learning, blended learning, cooperative learning, problem solving, mixed-methods research.

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TASARIM ODAKLI DÜŞÜNME YAKLAŞIMIYLA ÖĞRETİMİN FARKLI DEĞİŞKENLER BAKIMINDAN İNCELENMESİ

ÖZET

Bu karma yöntem çalışmasının amacı, İngilizce öğretiminde tasarım odaklı düşünme yaklaşımının ortaokul öğrencilerinin kelime öğrenme başarısı, işbirlikli öğrenme ve problem çözme becerileri üzerindeki etkisini araştırmaktır. Araştırma, 2020-2021 güz döneminde Türkiye'de bulunan bir ortaokulun 8. sınıfında öğrenim gören 43 öğrenci ile yürütülmüştür. Uygulama sürecinde tasarım odaklı düşünme yaklaşımının deney grubu öğrencilerinin kelime öğrenme başarısı, işbirlikli öğrenme algısı ve problem çözme becerileri üzerindeki etkisi araştırılmıştır. Kontrol grubunda ise harmanlanmış öğrenme yöntemi ile bağımlı değişkenler kontrol altına alındığı için tasarım odaklı düşünme yaklaşımı dışındaki tüm uygulamalar aynı kalmıştır. Elde edilen nicel verileri desteklemek için nitel veriler kullanılmıştır. Nicel verileri toplamak için araştırmacılar tarafından geliştirilen ölçme araçları kullanılmış, nitel verileri öğrencilerden toplamak için ise görüşme soruları hazırlanmıştır. Sonuç olarak, tasarım odaklı düşünme yaklaşımı, öğrencilerin kelime öğrenme başarısı, işbirlikli öğrenme algısı ve problem çözme becerisi açısından deney grubu lehine anlamlı bir farklılık göstermiş ve öğrenciler üzerinde olumlu bir etkiye sahip olmuştur.

Anahtar Sözcükler: Tasarım odaklı düşünmeye dayalı öğrenme, harmanlanmış öğrenme, işbirlikli öğrenme, problem çözme, karma yöntem araştırması

1. INTRODUCTION

To educate individuals suitable for the requirements of the 21st century, it is imperative to increase students' awareness in cognitive and affective domains and help them experience design thinking. Design thinking is described as solutions generated through designs for the problems induced by the needs (Spencer & Juliani, 2016). The concept of design thinking has turned into action with the innovation trends, forming the fundamental elements of unlimited technological development (Özekin, 2006). According to Scheer (2017), the presence of the design thinking approach in education has many benefits for students. Through the design thinking approach, students not only generate solutions to problems faster, but also tend to think creatively. Because design thinking is project-based, they can gain teamwork responsibility by collaborating. In this sense, one could argue that the design thinking approach is also related to the cooperative learning method. Cooperative learning is a method of learning a subject by forming small groups of students to solve a problem or perform a task for a common purpose by working together (Demirel, 2011). A cooperative learning environment is also considered very effective in foreign language teaching, as it supports students in providing linguistic information to each other (Bejarano, 1987; Ghaith et al., 2003; Soylu, 2008).

New methods, techniques, and approaches are being developed every day in foreign language teaching, sometimes due to technological developments and the requirements arising from these developments. Therefore, this study employed the design thinking approach, cooperative learning, and

problem-solving methods developed to contribute to vocabulary learning, the most challenging area in English learning.

Learning through cooperative problem-solving is an effective method for student learning (Alavi, 1994). Artzt and Newman (1990) defined cooperative learning as a problem-solving activity for learning groups to achieve a common goal. In this sense, establishing a cooperative learning environment when solving a problem or completing a task significantly affects student participation and the effectiveness of the environment (Akgün, 2012).

Vocabulary learning is one of the most common problems encountered in teaching English (Ghazal, 2007). Although there are many findings on cooperative learning and problem-solving in the literature, there is a gap in relation to the design thinking approach. Therefore, it was decided to undertake this study because this is a problem state worth investigating in this field. Research shows that the cooperative learning method is effective in foreign language learning vocabulary (Bejarano, 1987) and studies on design thinking in learning a foreign language/English (Sözler, 2019). However, when the existing studies were examined, no study employed design thinking, vocabulary learning, cooperative learning, and problem-solving methods together.

All these methods (design thinking, cooperative learning, and problem-solving methods) were used in this study to create products in a foreign language (English) through vocabulary learning and writing, one of the four basic language skills. Although vocabulary learning is one of the major problems encountered in learning English, teachers and students believe that teaching and learning foreign language vocabulary is a problem that can be overcome if appropriate methods and strategies are employed (Gu & Johnson, 1996).

1.1. Design Thinking and Its Systemic Structure

Design thinking can be used primarily in different professional fields such as architecture, engineering, product designing, and digital designing (Melles et al., 2012). In addition, considering the historical development of design thinking, the form of design thinking was primarily used in architecture and engineering fields (Özekin, 2006).

In design thinking, there is no absolute rule or method for making a product that emerges at the end of a design process. The product takes shape according to an individual's cognition, knowledge, perspectives, perceptions, and experiences (Koh et al., 2015). The process, which starts with imagination in individuals' minds, is synthesized and materialized with their knowledge and experiences (Rauth et al., 2010). In general, the systemic structure of design thinking could be illustrated as in figure 1.

Figure 1. Symbolic Structure of Design Thinking

Therefore, it can be stated that design thinking is based on the problem detection and solution cycle. Design thinking processes start by discovering the problem and continue with understanding the problem and the need fully, generating ideas by collecting information and data about the problem, producing prototypes by concretizing the ideas (concepts in mind), testing, and feedback phases.

An examination of the literature showed variation in design thinking stages (Scheer, 2017). However, the design thinking stages detailed by Scheer (2017), which are the most comprehensive and most used in the literature, were employed in this study.

Scheer (2017) noted that the design thinking process consists of six different but cyclical phases in which "expansion" and "consolidation" take place, respectively. This is because problems, decisions, and solutions may change sharply in the process. Scheer (2017) describe the stages of design thinking as follows:

**Understand and observe (expanding)* **Synthesis (consolidating)*

**Ideate (expanding)* **Prototype (consolidating)*

**Test (expanding)* **Iteration (consolidating)*

Understand and observe: In order to solve an existing problem, it is important to understand the problem first, and then to empathize with people by understanding them.

Synthesis: In order to generate meaningful ideas about solving the problem, the problem and its context should be analyzed very well in the "observation and understanding" stage.

Ideate: Mind exercises, creativity, teamwork, brainstorming and getting the ideas of teammates, converting information into problem-solving ideas (cooperatively), and the ability to put knowledge into practice come to the fore. It is a process of designing solutions/products abstractly in one's mind by bringing together ideas and information as a meaningful whole.

Prototype: This is the stage where the design process takes on flesh and bone. It is the stage in which ideas are made concrete, tangible, usable, and testable.

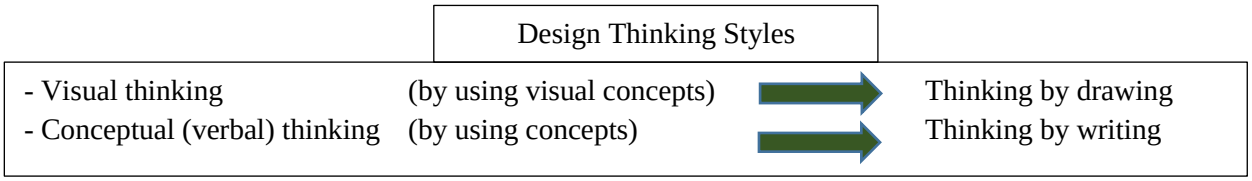
Test: Feedback has an important place. Ideas about the solution are generated through feedback. Feedback can be received from anyone involved in the process.

Iteration: It is the sixth stage of the design thinking process. The design thinking process consists of six stages that are interrelated and built on each other, and the natural cycle is maintained while the process is being followed. When necessary, one can return to the first stage.

1.2. Design Thinking Styles

Design thinking is grounded on productive thinking. Bell (2008) defined "productive thinking" as a way of thinking that individuals develop to solve problems and generate new solutions. However, about productive thinking, an idea cannot be concretized only by "conceptual (verbal) thinking" or only by "visual thinking". "Conceptual (verbal) thinking" and "visual thinking" must be externalized (Bell, 2008).

The resultant concrete product of the design thinking process includes a "mental process map" of individuals because they have their own value judgments in both the solution and the product. These value judgments are also shaped according to the time, geography, and environment in which individuals live. In this sense, emotions, senses, intuitions, intelligence, wisdom, and creativity are equally influential in design thinking (Melles et al., 2012). In short, design thinking is not a rational process alone. Intuitions and perceptions are as important as rationality.



*(Koçkan, 2012)

Figure 2. Design Thinking Styles

From a general perspective, visual thinking is based on images, and conceptual (verbal) thinking is based on concepts.

Visual thinking: In the design thinking process, once an idea occurs, the individuals visualize this idea in their minds. In this sense, thinking is shaped more through visual thinking (Rauth et al., 2010). In visual thinking, the idea (image) is drawn and transferred to the outside by using visual concepts.

Conceptual (verbal) thinking: It is grounded on thinking with concepts. In the design thinking process, after discovering the problem, individuals bring the experiences and images related to the problem from their subconscious to their consciousness. The past knowledge and experiences of individuals and the newly acquired knowledge and experiences are brought together and concepts are formed in their minds (Brown and Katz, 2019). The concept is not ready in the mind of the individual when the design is started. After a number of mental processes, the concept is reached in the individual's mind. The concept is unique to the individual. In this sense, it is original and produced by individuals (Koçkan, 2012).

Considering all this information, this study aimed to investigate the effect of the design thinking approach on vocabulary learning achievement, cooperative learning, and problem-solving skills of secondary school students in teaching English. The main research question was expressed as "What is the effect of the design thinking approach on vocabulary learning achievements, cooperative learning perceptions, and problem-solving skills of secondary school students in teaching English?" Accordingly, answers were sought for the following questions:

1. Is there a significant difference between the vocabulary learning achievement scores of the experimental group students exposed to the design thinking approach and the control group students?
2. Is there a significant difference between the cooperative learning perception scores of the experimental group students exposed to the design thinking approach and the control group students?
3. Is there a significant difference between the problem-solving skills scores of the experimental group students exposed to the design thinking approach and the control group students?
4. What are the views of the experimental group students about the design thinking approach?

2. METHODOLOGY

2.1. Research Design

A mixed-methods research design was employed in this study using qualitative and quantitative data together. Of mixed-methods research approaches, an intervention design was used. The mixed-methods research integrates the quantitative and qualitative data using their valuable aspects, enabling an in-depth investigation of a research problem (Creswell, 2003). The intervention design is a mixed-methods research design in which the quantitative data obtained through an experimental study are supported by qualitative data (Creswell, 2003). According to Creswell (2003), the qualitative data collected in a study can be included in the research before, during, and after an experiment. In this study, qualitative data were collected during and after the intervention. The quantitative data were collected as a pretest and posttest in two phases. First, the quantitative pretest data were collected. The integration was carried out by adding the qualitative data during and after the intervention. The types of integrated qualitative data were added during and after the intervention design. The integration was performed in data collection, analysis, results, and discussion sections. In the qualitative part, the answers given to the interview question were used.

Using a mixed-methods intervention design in a study means that an experiment will be conducted. However, Kerlinger (1986) argues that performing a full-random assignment of participants in studies conducted in educational institutions is very unlikely. In cases where it is not possible for the researcher to randomly assign participants, the researcher cannot create new groups. In such cases, quasi-experimental

designs are preferred (Creswell et al., 2017). In this study, a quasi-experimental design was employed, as two existing groups were selected.

The independent variable of this study is the design thinking approach based on teaching the vocabulary (in unit 5, 6, 7) determined under the theme of "Moonlight" in the English textbook. The dependent variables of the study are students' vocabulary learning achievement, cooperative learning perceptions, and problem-solving skills.

2.2. Participants

The study group consists of 43 eighth-grade students receiving education in the 2020-2021 academic fall semester in Mersin Province, Turkey. Of these students, 23 were in the experimental group and 20 in the control group. The study group was formed and determined as per the impartiality criteria. In order to choose two grade eight English classes with similar English course average scores as experimental group and control groups and minimize the problems that may arise during students' participation in online or offline distance education activities, two classes of equal levels, where all students had access to computers and internet, were determined and randomly assigned to experimental and control groups. Information about the study participants is given in Table 1.

Table 1. Gender Distribution of the Experimental and Control Group Students

Gender	Experimental Group		Control Group		Total	
	f	%	*f*	%	*f*	%
Female	10	43.4	9	45	19	44.2
Male	13	56.6	11	55	24	55.8
Total	23	100	20	100	43	100

In the study, normality tests were performed per pretest scores of the groups, and Skewness and Kurtosis values were examined. It was seen that the pretest data collected from the experimental and control groups were within the normal distribution limits. Based on this finding, it was decided to conduct parametric statistical analyses with the collected data. In the meantime, when the pretest scores of the groups were compared using a t-test, there was no significant difference between the English Achievement Test mean scores ($t_{41} = 0.437$; $p > .05$), Cooperative Learning Perception mean scores $t_{41} = 1.641$; $p > .05$), and Problem-Solving Skills mean scores ($t_{41} = 1.464$; $p > .05$). Since there was no significant between-group difference, the groups were randomly assigned as experimental and control groups.

2.3. Research Instruments and Procedures

The "English Vocabulary Achievement Test" and "Secondary School Students' Cooperative Learning Perception Scale" developed by the researchers and the "Problem-Solving Inventory for Children" developed by Serin et al. (2010) were employed in the study to collect the quantitative data. A multiple-

choice “English Vocabulary Achievement Test” was prepared to determine the achievement levels of 8th-grade students in vocabulary learning. The “Moonlight” in grade 8 student textbook consists of 39 questions covering the vocabulary in units 5, 6, and 7. The difficulty of the tests is at a medium level (0.53). The “Secondary School Students’ Cooperative Learning Perception Scale” has been devised as a 5-point Likert scale to measure secondary school students’ perceptions of cooperative learning. It consists of 26 items and two sub-factors with a reliability coefficient of 0.88. The Problem-Solving Inventory for Children has been developed in 2010 for secondary school students to measure their self-perception regarding problem-solving skills. This measurement tool consists of 24 five-point Likert type items. The Cronbach’s Alpha coefficient of the “Problem-Solving Inventory for Children” in this study was 0.84. In order to collect the qualitative data of the study, an interview form about the design thinking approach consisting of eight questions developed by the researchers was administered to the experimental group students.

The “English Vocabulary Achievement Test”, “Secondary School Students’ Cooperative Learning Perception Scale”, and the “Problem-Solving Inventory for Children” were administered to the experimental and control groups at the beginning (pretest) and the end (posttest) of an eight-week intervention.

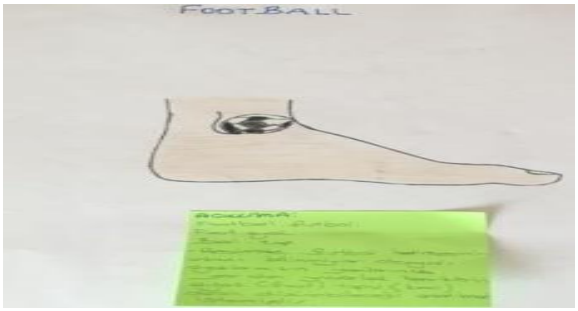
In order to find answers to the question regarding what the views of students in the experimental group were, the interview questions form about the design thinking approach was administered in the study. In creating the interview questions, the literature was examined, expert opinion was taken and questions were created. After the questions were created, they were presented to two English teachers for review for language and content validity, and the form was given its final shape based on the feedback. This form was only administered to the experimental group students at the end of the experimental procedures. In addition, the questions were systematically asked to the students at the end of each unit during the intervention to follow their design thinking process. Considering the feedback obtained from students, modifications were made regarding the intervention in the process per student and course requirements.

Necessary permissions were obtained to carry out the interventions in the study. The pre-pilot, pilot, and main intervention lasted for 1.5, three, and eight weeks, respectively. All the interventions were carried out by the researchers.

The researchers prepared the instructional design to implement in the experimental and control groups during the experimental procedures. In the intervention process, the three units in the Moonlight textbook, where the activities were carried out, were divided into weeks, and it was planned to cover one unit every two weeks. Of cooperative learning techniques, the Student Teams Achievement Division (STAD) technique is selected. Regarding this technique, the lessons were primarily conducted by the researcher in the presentation phase, and the information on the subject was shared with the students through lectures or discussions. Attention was paid to the heterogeneous distribution of student teams. According

to the assessments, the group with the highest group total score was given an achievement label as a group award. Moreover, 75% of lessons were conducted face-to-face and 25% online. The Zoom platform was used for online activities. Other applications used in the study were Reverso Context, Easy Voice Recorder Pro, Audio Dictionary, and Speak to Text Translator. In the study, the "Taboo-English" game was played online for each unit. The only difference between the lesson plan applied to the experimental and control groups was that a course design suitable for the design thinking approach was used in the program applied to the experimental group. Other parts of the program were the same as the program applied to the control group. Students in the experimental group did drawings regarding the vocabulary they could not learn before, using the steps of design thinking. At the end of the study, they wrote a composition/short story, using the vocabulary given in the units in the study. Making prototypes is one of the stages of the design thinking process. However, Koh et al. (2015) stated that making pre-prototypes generally takes on the same auxiliary tasks as drawing in the design thinking process. In this study, students were asked to do drawings, since it would be problematic in terms of time and cost to make prototypes of all words they considered a problem. In the first week of the intervention, students were given a concept (Notion) that they knew its meaning to set an example for the *notion* and *concept* related to design thinking. In the next stage, the researcher asked the students to think about and draw how they would express the concept if they did not know its meaning at all. Here, the researcher wanted to investigate how students can reach a concept (Concept) from a concept they know (Notion) by thinking freely.

Some students described the concept of "FOOTBALL" (Notion) as follows (Concept): "If we didn't know the word football, considering that *foot* means foot and *ball* means ball, we would think that the round bones on either sides of our feet are the balls of our feet." An example of an image related to the description is given below.



Picture 1.

In general, congruity problems were observed in both groups, especially in the first two weeks. However, from the 3rd week on, the students in both groups showed more interest in the lesson by getting used to the process. From the 4th week on, there was a noticeable increase in student interest, motivation, and attitudes toward the course, their friends, and the researcher, especially in the experimental group.

Students started sharing the information they came across in daily life about design thinking in the classroom and bringing authentic materials (newspapers, magazines, etc.). A verbal evaluation of the process was made with the experimental group students in the eighth week of the intervention process and some students were observed to use the phrase “finding the right from wrong”, which could become the motto of this study with respect to the design thinking approach.

2.4. Data Analysis

Before performing statistical operations in the study, normality tests were performed for all dependent variables. Accordingly, the data satisfied the conditions for performing parametric statistical operations. According to the results of independent sample t-tests performed to determine the equivalence of the study groups in English achievement test, cooperative learning perception, and problem-solving skills, the mean English achievement test ($t_{41} = 0.437$, $p > .05$), cooperative learning perception ($t_{41} = 1.641$, $p > .05$), and problem-solving skills ($t_{41} = 1.464$, $p > .05$) pretest scores did not significantly differ. Since there was no significant difference between the groups, the groups were randomly assigned as experimental and control groups. Parametric tests (t-test and Cohen d index) were calculated to analyze the quantitative data in the study. In the analysis of the data collected in this study, the level of significance was accepted as 0.5.

Content analysis was employed to analyze the qualitative data. Content analysis is a method that involves classifying, editing, and comparing texts to make theoretical inferences (Cohen et al., 2007). Firstly, codes were determined and then themes (categories) were created based on these codes in content analysis (Merriam, 2009; Patton, 2002). According to Yildirim and Simsek (2013), content analysis aims to reach concepts and themes that can explain the collected data, to gather similar data within the framework of certain concepts and themes, and to present them in a way that the reader can comprehend.

2.5. Validity and Reliability

In the study, the data were presented with direct quotations without students’ opinions to ensure validity. In addition, the obtained answers were analyzed in detail. In terms of the reliability of the study, the data were coded separately by the researcher and two content experts to calculate the consistency rates of the codes in the study by using the formula of Reliability = [Agreement / (Agreement + Disagreement) x 100]. According to Miles and Huberman (1994), the percentage of consistency must be 70% and more. According to the formula, the reliability of the study was calculated as 93%, which shows that the study has a high-reliability rate. After these procedures were done to achieve validity and reliability, the findings were described and interpreted.

3. FINDINGS

The findings of the study are presented as follows in accordance with the research questions of the study.

3.1. Is there a significant difference between the vocabulary learning achievement scores of the experimental group students exposed to the design thinking approach and the control group students?

Vocabulary achievement pretest and posttest scores of students in the experimental and control groups in this study were examined to answer the research question mentioned above. The findings are given in Table 2.

Table 2. T-Test Results for Vocabulary Achievement Pretest and Posttest Scores of Experimental and Control Groups

Group	Test	*N*	$\bar{X}$	*SD*	*SE*	*df*	*t*	*p*
Experimental Group	Pretest	23	29.65	6.36	1.32	22	15.896	.000
	Posttest	23	17.21	3.66	.76			
Control Group	Pretest	20	16.70	4.10	.91	19	-1.962	.065
	Posttest	20	17.50	3.60	.80			

$p < .05$

As seen in Table 2, there was a significant difference between the mean pretest and posttest "English Vocabulary Achievement Test" scores of experimental group students ($t_{22} = -15.896$, $p < 0.05$). As the experimental group students' mean posttest "English Vocabulary Achievement Test" score (29.65) was higher than their mean pretest score (17.21), the significance difference favored the posttest. In order to determine the magnitude of this difference, the effect size value was calculated as 2.39. This value, calculated using Cohen's *d* index, was greater than 1, showing that the "design thinking approach" was strongly effective in increasing the experimental group students' English vocabulary learning achievement. However, there was no significant difference between the control group students' mean pretest and posttest "English Vocabulary Achievement Test" scores ($t_{19} = -1.962$, $p > 0.05$).

3.2. Is there a significant difference between the cooperative learning perception scores of the experimental group students exposed to the design thinking approach and the control group students?

In order to answer the research question given above, the experimental and control group students' cooperative learning pretest and posttest scores were examined. The findings are given in Table 3.

Table 3. T-Test Results for Experimental and Control Group Students' Pretest and Posttest Scores from the Cooperative Learning Perception Scale

Group	Test	*N*	$\bar{X}$	*SD*	*SE*	*df*	*t*	*p*
Experimental Group	Pretest	23	3.85	.38	.08	22	-15.260	.000
	Posttest	23	4.89	.19	.04			
Control Group	Pretest	20	3.60	.60	.13	19	-9.044	.000
	Posttest	20	4.59	.45	.10			

$p < .05$

According to Table 3, there was a significant difference between the experimental group students' Cooperative Learning Perception Scale pretest and posttest mean scores (t_{22} = -15.260, $p < 0.05$). The experimental group students' Cooperative Learning Perception Scale posttest arithmetic mean (4.89) was higher than their pretest mean score (3.85), favoring their posttest score. In order to determine the magnitude of this difference, the effect size was calculated as 3.46. As this value, calculated using Cohen's *d* index, was greater than 1, one could say that the "design thinking approach" has strongly affected the experimental group students' Cooperative Learning Perceptions. As such, there was a significant difference between the control group students' Cooperative Learning Perception Scale pretest and posttest mean scores (t_{19} = -9.044, $p < 0.05$). As the control group students' Cooperative Learning Perception Scale posttest arithmetic mean score (4.59) was higher than their pretest mean scores (3.60), the significant difference was in favor of the posttest. In order to determine the magnitude of this difference, the effect size was calculated as 1.86. This value, which was calculated using Cohen's *d* index, was greater than 1, showing that the control group students had a strongly higher posttest mean score from the Cooperative Learning Perception Scale.

3.3. Is there a significant difference between the problem-solving skills scores of the experimental group students exposed to the design thinking approach and the control group students?

In order to answer the research question above in the study, the experimental and control group students' pretest and posttest problem-solving scores were examined. The findings are given in Table 4.

Table 4. T-Test Results for Experimental and Control Group Students' Pretest and Posttest Scores from the Problem-Solving Inventory for Children

Group	Test	*N*	$\bar{X}$	*SD*	*SE*	*df*	*t*	*p*
Experimental Group	Pretest	23	3.52	.64	.13	22	-8.068	.000
	Posttest	23	4.70	.37	.07			
Control Group	Pretest	20	3.20	.80	.17	19	2.109	.048
	Posttest	20	3.00	.73	.16			

$p < .05$

As seen in Table 4, there was a significant difference between the experimental group students' Problem-Solving Inventory for Children pretest and posttest mean scores (t_{22} = -8.068, $p < 0.05$). The experimental group students' Problem-Solving Inventory for Children posttest arithmetic mean (4.70) was higher than their pretest mean score (3.52), favoring their posttest score. In order to determine the magnitude of this difference, the effect size was calculated as 4.7. This value, which was calculated using Cohen's *d* index, was greater than 1, indicating that the design thinking approach strongly affected the experimental group students' problem-solving skills. There was also a significant difference between the control group students' Problem-Solving Inventory for Children pretest and posttest mean scores (t_{19} = -2.109, $p < 0.05$). As the control group students' Problem-Solving Inventory for Children pretest arithmetic mean score (3.20) was higher than their posttest mean score (3.00), the difference was in favor of their pretest. In order to determine the magnitude of this difference, the effect size was calculated as 3.2. This value, calculated using Cohen's *d* index, was greater than 1, showing that the control group students had a strongly higher pretest mean score from the problem-solving inventory

3.4. What are the views of the experimental group students about the design thinking approach?

Interviews were conducted with the experimental group students to answer the fourth research question of the study. The resultant findings are presented below.

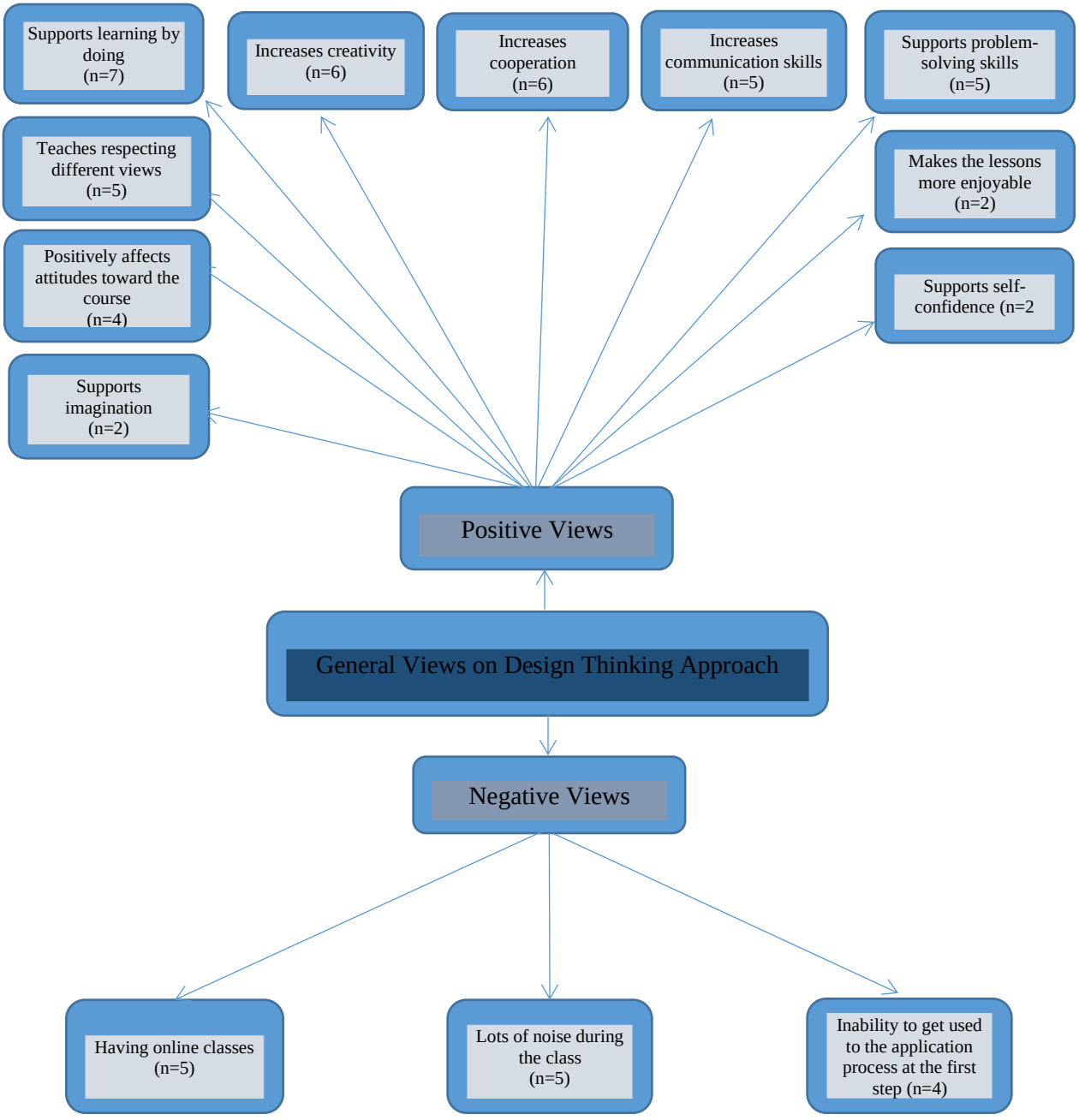


Figure 3. General Views of the Experimental Group Students on Design Thinking Approach

As shown in Figure 3, the majority of students expressed positive views (44), except for a few who expressed negative views (14). Regarding students' positive views, students stated that the design thinking approach mostly supports learning by doing (f=7), increases creativity (f=6), increases cooperation skills (f=6), increases communication skills (f=), positively affects attitudes toward the course (f=4), support imagination (f= 2), makes the lesson more enjoyable (f=2), and supports self-confidence (f=2). Regarding students' negative views, students expressed their views as having online classes (f=5), lots of noise during the class (f=5), and inability to get used to the application process in the first step (f=4). Student views

supporting the sub-themes frequently used under the theme of *Positive Views* are as follows: "Owing to the design method, we do everything ourselves in the lesson. We constantly move and continuously work. What I love most about this new practice is to freely draw whatever I want and create figures after each word. I can say that there is no word that I have not learned" (S-20). Student views under the theme of *Negative Views* are as follows: "I can say that I really like this method. Except for the lessons we do online on Tuesdays" (S-17).

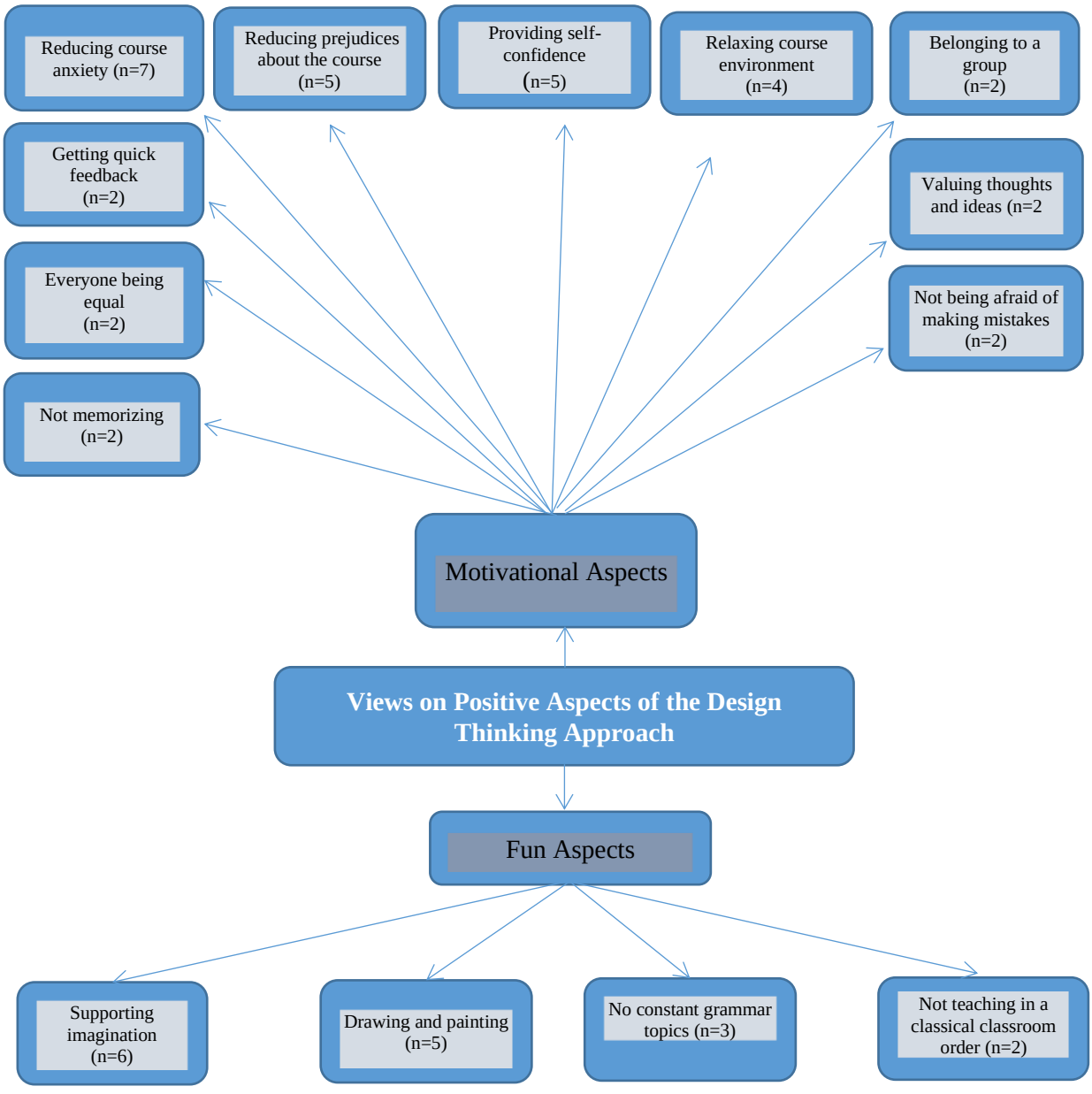


Figure 4. Experimental Group Students' Views on Positive Aspects of the Design Thinking Approach

As seen in Figure 4, the majority of students expressed positive views on the motivational aspects of the design thinking approach (33), and some expressed positive views on the fun aspects of this approach (16). Students' views on its motivation aspects included reducing the course anxiety (f=7), reducing prejudices about the course (f=5), providing self-confidence (f=5), relaxing course environment (f=4), belonging to a group (f=2), getting quick feedback (f=2), everyone being equal (f=2), not memorizing (f=2), valuing thoughts and ideas (f=2), and not being afraid of making mistakes (f=2). Students' views on the fun aspects of the design thinking method included supporting imagination (f=6), drawing and painting (5), no constant grammar topics (f=3), and not teaching in classical classroom order (f=2). Student views supporting the sub-themes frequently used under the theme of Motivational Aspects are as follows: "The most positive aspect of this method is that I don't feel so comfortable in any class" (S-16). Student opinions supporting the sub-themes under the theme of *fun aspects* are as follows: "The most positive aspect of this class for a student who dreams of being a painter was that I could draw while learning vocabulary. I have never enjoyed any class this much, except for painting classes" (S-11).

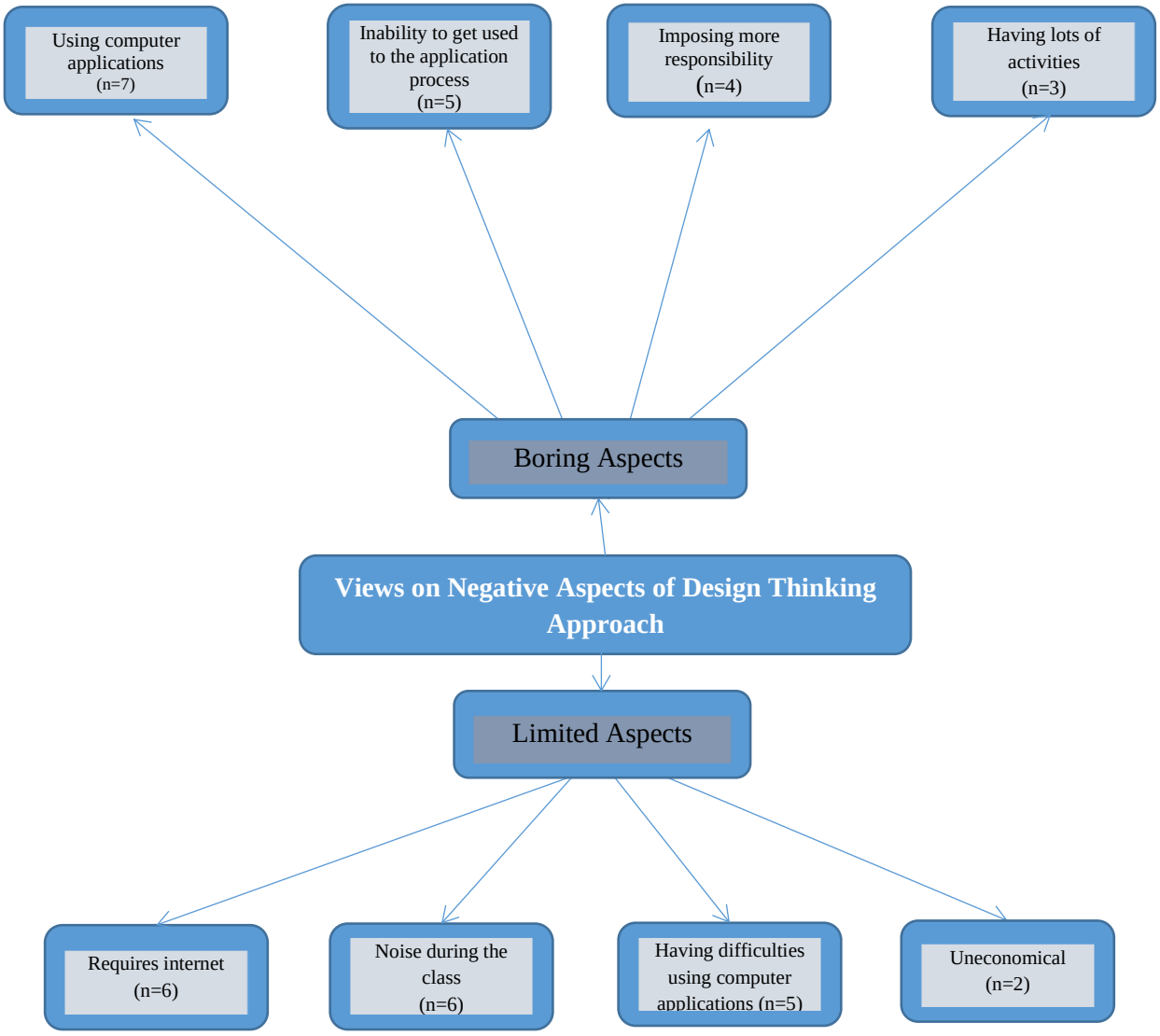


Figure 5. Experimental Group Students' Views on Negative Aspects of the Design Thinking Approach

As illustrated in Figure 5, some students expressed negative views regarding the boring aspects (19) and some regarding the limited aspects (19) of the design thinking approach. Regarding the "boring aspects" sub-theme, students mostly expressed opinions concerning the use of computer applications (f=7), inability to get used to the application process (f=5), imposing more responsibility (f=4), and having lots of activities (f=3). Regarding the limited aspects of the design thinking method, students stated that this method requires internet (f=6), causes noise during the class (f=6), and is uneconomical (f=2). Student views supporting the sub-themes frequently used under the theme of *boring aspects* are as follows: "It was nice to learn about the existence of new applications on the computer, but it was also boring when we used it compulsorily in distance education" (S-1). Student views supporting the sub-themes frequently used under the theme of *limited aspects* are as follows: "In general, I have a positive opinion, but we need internet in all distance education courses and this can cause stress for us" (S-10).

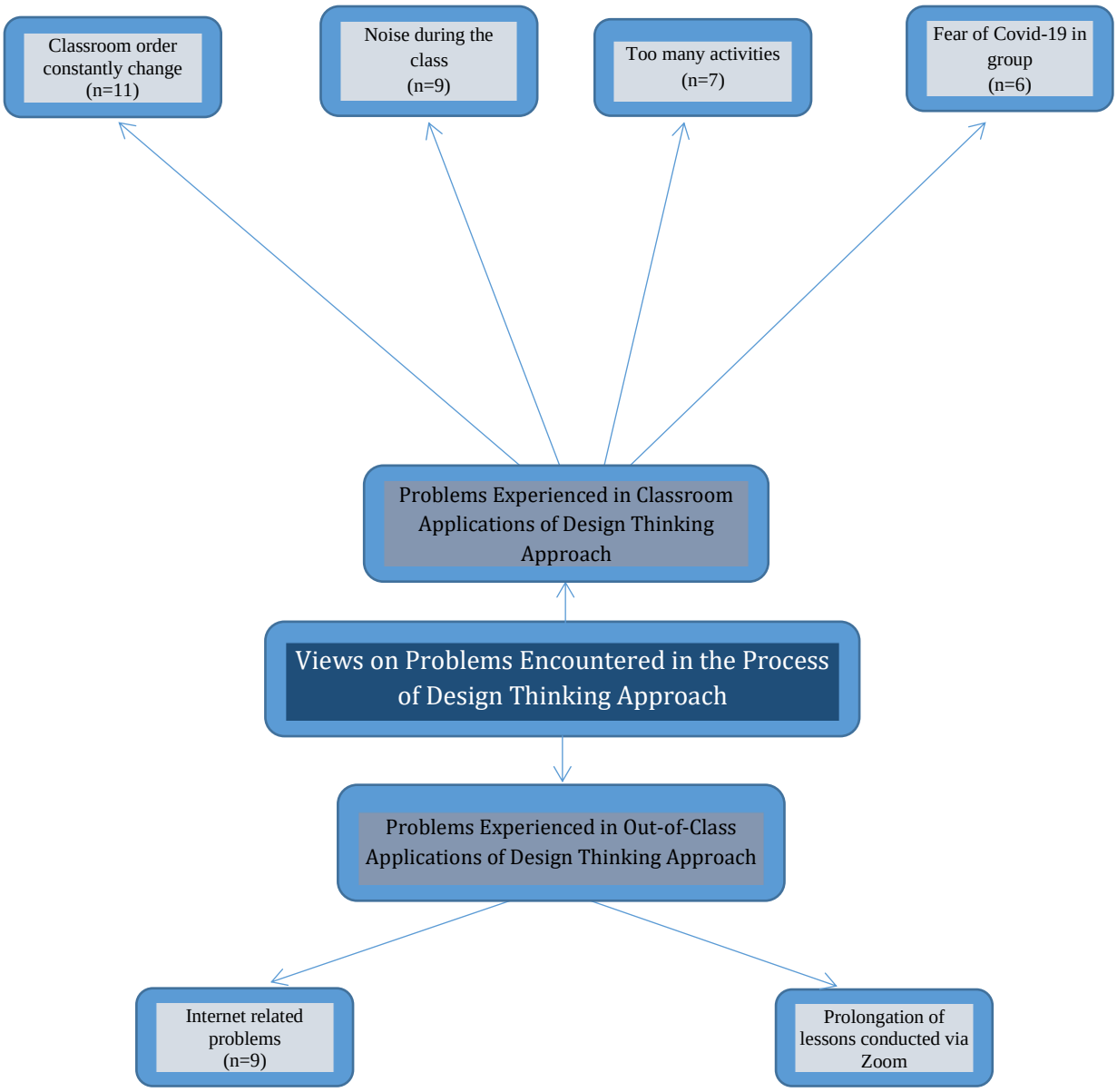


Figure 6. Experimental Group Students' Views on Problems They Encountered Regarding the Process of Design Thinking Approach

As shown in Figure 6, some students expressed their views about the problems experienced in classroom practices (33) and some about the problems experienced in out-of-class practices (13) during design thinking processes. Students stated that the classroom order constantly changes (f=11) and there are noises during the class (f=9), too many activities (f=7), and fear of Covid-19 in group work (f=6). Students' views regarding the problems experienced in out-of-class applications of design thinking approach focused on the problems experienced because of the internet (f=9) and the prolongation of lessons conducted via Zoom (f=4). Student views supporting the frequently used sub-themes under the theme of "problems experienced in classroom practices" are as follows: "The biggest problem I have encountered is that there

is too much noise in the classroom" (S-7). Student views supporting the sub-themes used within the scope of the theme "problems experienced in out-of-class practices" are as follows: The prolongation of classes we had via Zoom and the problems we experienced with the internet were the problems we encountered and complained about the most during the class" (S-5).

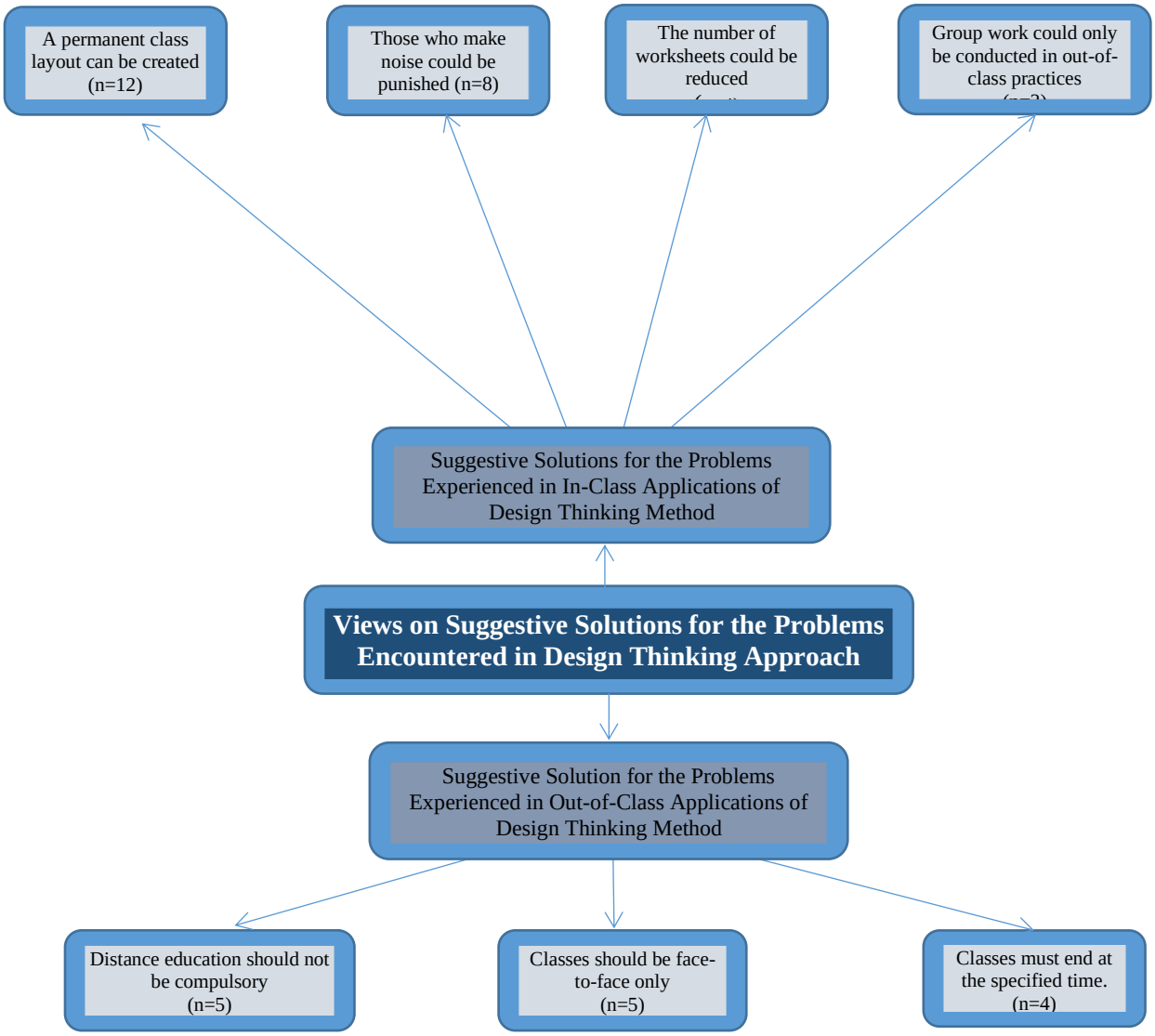


Figure 7. Experimental Group Students' Views on Solutions for the Problems They Encountered in the Process of Design Thinking Approach

As seen in Figure 7, some students expressed their views on solving the problems experienced in classroom practices in design thinking processes (27), while others expressed views on solving the problems experienced in out-of-class practices (14). Regarding the sub-theme of suggestive solutions for the problems experienced in in-class applications of the design thinking method, students mostly stated that a permanent classroom order could be established (f=12), those who make noise could be punished (f=8), the number of worksheets could be reduced (f=4), group work could only be conducted in out-of-class practices

(f=3). Regarding the suggestive solutions for the problems experienced in out-of-class applications of the design thinking method, students suggested that distance education should not be compulsory (f=5), classes should be face-to-face only (f=5), and classes should end at the specified time (f=4). Student views supporting the sub-themes used under the theme of "suggestive solutions for the problems experienced in in-class practices" are as follows: "I said the activities we did using the worksheets were too intense. I can suggest reducing the number of these worksheets" (S-21). Student views supporting the sub-themes used under the theme of "suggestive solutions for the problems experienced in out-of-class practices" are as follows: "…My suggestion is that distance education should not be kept compulsory" (S-19).

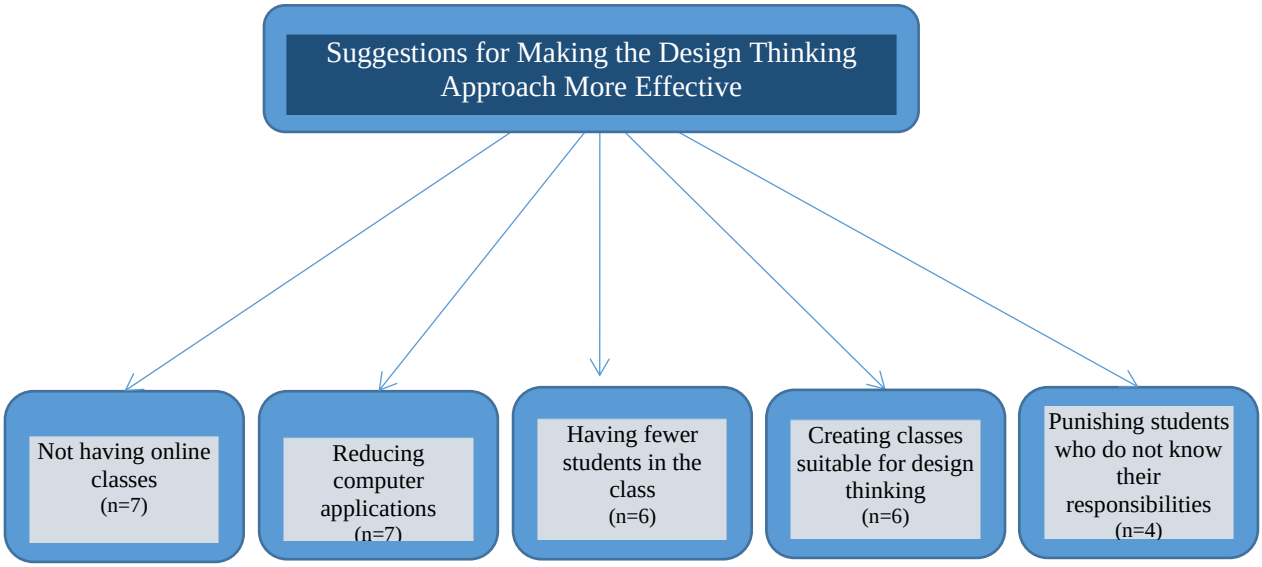


Figure 8. Experimental Group Students' Suggestions about Making the Design Thinking Approach More Effective

Figure 8 shows that students mostly suggested not having online classes (f=7), reducing computer applications (f=7), having fewer students in the classroom (f=6), creating classes suitable for design thinking (f=6), and punishing students who do not know their responsibilities (f = 4). Student views regarding their suggestions for making the design thinking approach more effective are as follows: "My suggestion for it to be more effective is to remove the distance education courses and conduct the courses in the classroom so that they can be more effective" (T-5).

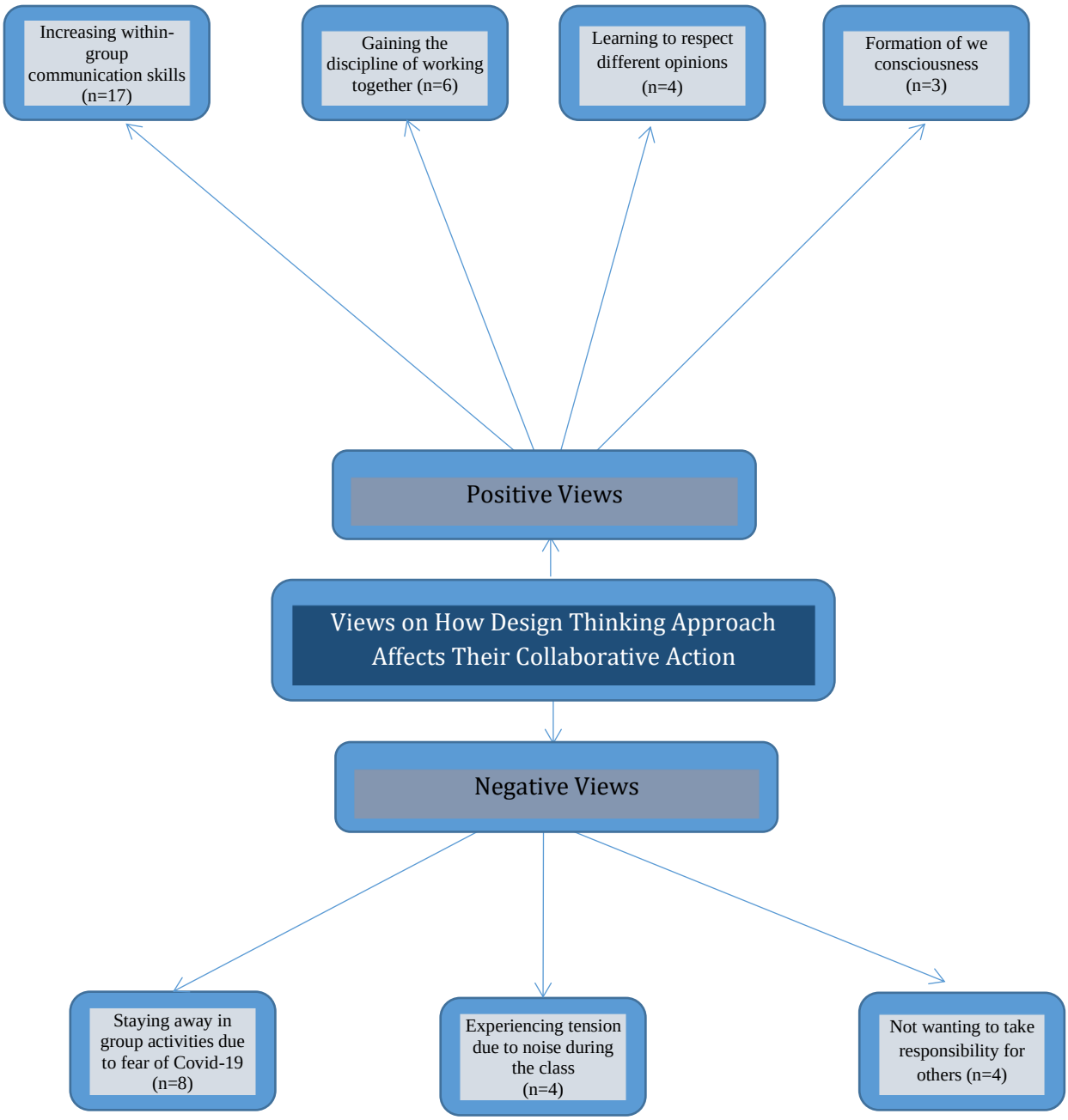


Figure 9. Experimental Group Students' Views about How Design Thinking Approach Affects Their Cooperation with Their Classmates

Figure 9 indicates that the majority of students had positive views (21), while some had negative views (16). Students' views on the sub-theme of "positive views" about how the design thinking approach affected their cooperation with their classmates mostly involved increasing within-group communication skills (f=7), gaining the discipline of working together (f=6), respecting different ideas (f=4), and the formation of we consciousness (f=4). Students' views relating to the sub-theme of "negative views" about how the design thinking approach affects their cooperation with their classmates including Staying away

from group work due to fear of Covid-19 (f=8), experiencing tension due to noise during the class (f=4), and not wanting to take responsibility for others (f=4).

The views of students supporting the frequently used sub-themes under the theme of "Positive Views" are as follows: "It influenced my ability to talk more to my friends in my group, discuss with them, and understand them better" (T-18). Student views supporting the sub-themes used under the theme of "negative views" are: "…However, we sometimes got angry and offended each other because there was too much noise in the classroom. I can say that this has had a negative impact on me" (S-8).

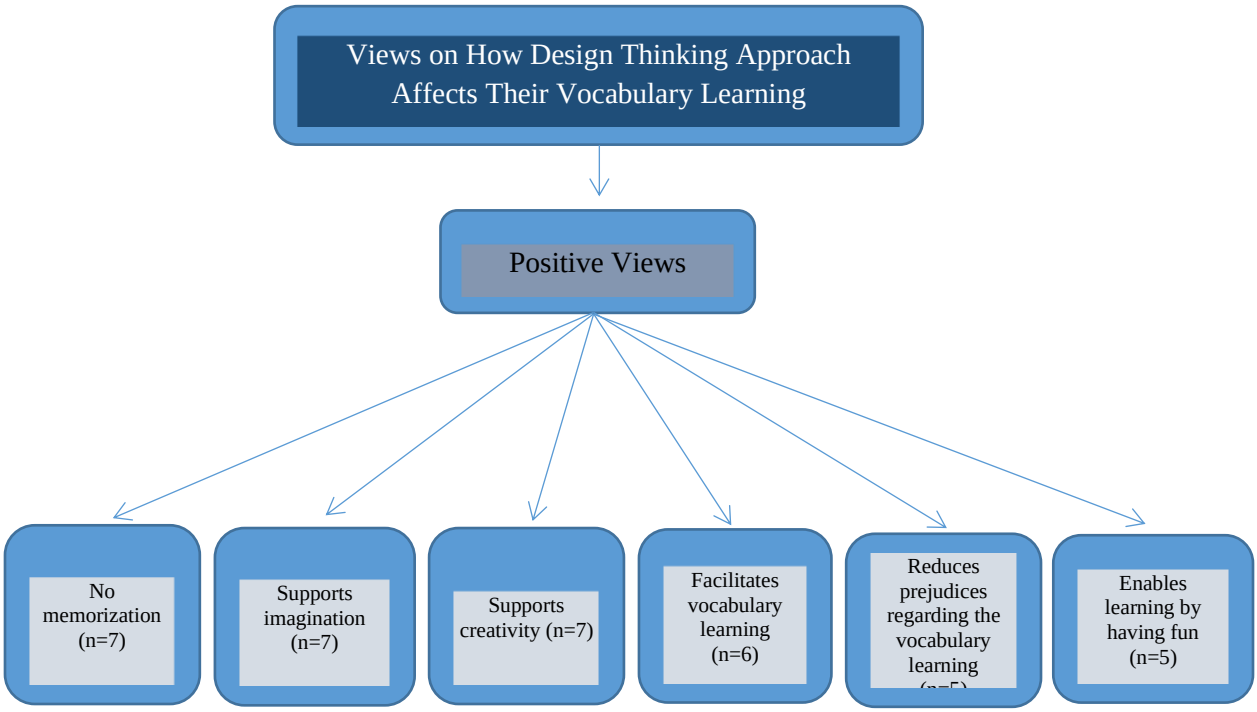


Figure 10. Experimental Group Students' Views about How Design Thinking Approach Affects Their Vocabulary Learning

Figure 10 shows that all students (30) expressed positive views. Regarding how the design thinking approach affected their vocabulary learning, under the sub-theme of *positive views*, students mostly stated that there is no memorization (f=7) and the method supports imagination (f=7), supports creativity (f=7), facilitates vocabulary learning (f=6), reduces prejudices regarding the vocabulary learning (f=5), and enables learning by having fun (f=5). Student views supporting the sub-themes frequently used under the theme of *positive views* are as follows: *"It affected me in terms of learning vocabulary easily and without memorizing"* (S-14).

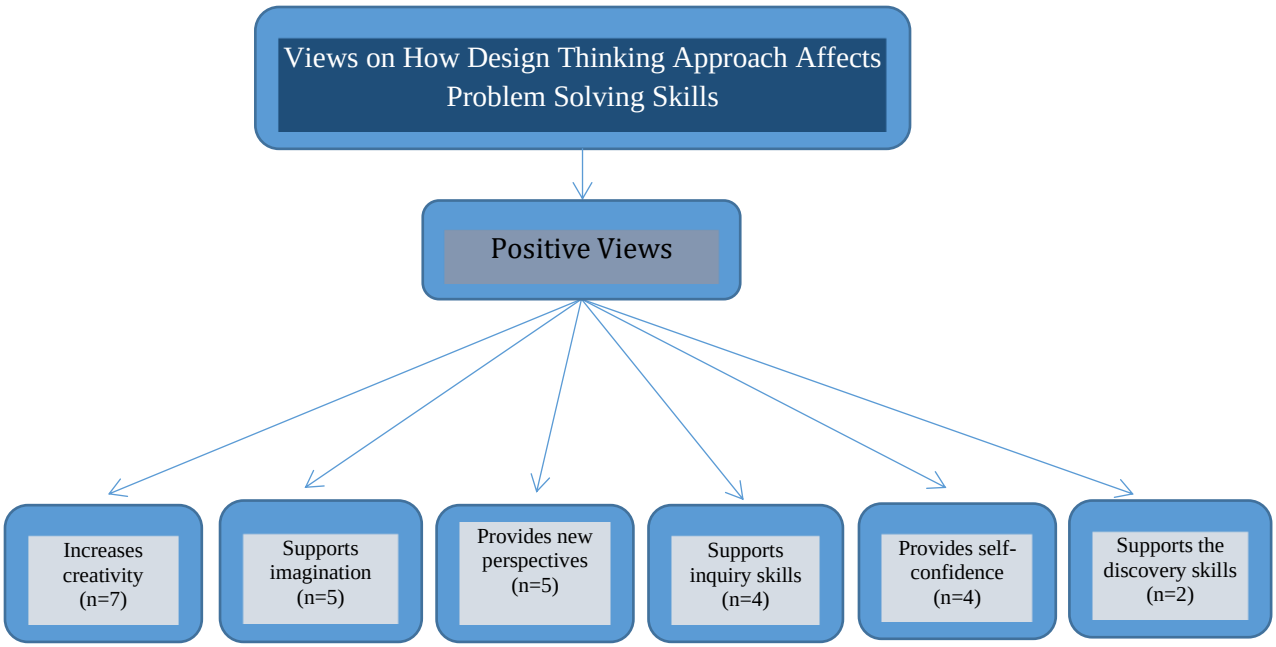


Figure 11. Experimental Group Students' Views about How Design Thinking Approach Affects Their Problem-Solving Skills

As seen in Figure 11, all students expressed positive views (27). Students' views relating to the sub-theme of "positive views" regarding how the design thinking approach affects their problem-solving skills highlighted the fact that this approach increases creativity (f=7), supports imagination (f=5), provides new perspectives (f=5), supports inquiry skills (f=4), provides self-confidence (f=4), and supports the discovery skills (f=2). Student views supporting the sub-themes frequently used under the theme of "positive views" are as follows: "…This method improved my problem-solving skills" (S-8).

4. DISCUSSION AND CONCLUSION

Concerning the first research question, the essence of design thinking is to explore the problem. This desire to explore in the design thinking process increases students' sense of curiosity. A student, whose desire to explore increases with the impulse of curiosity, looks at a dictionary to learn the word and learn the word by asking their friends or teacher (Eggen & Kauchak, 1996). In this sense, with this stage in design thinking processes, the student who considers vocabulary learning problematic firstly learns how to deal with this problem through exploration. This situation may have influenced the experimental group students to have higher vocabulary learning achievement scores than the control group.

Concerning the second research question, according to Öner and Gedikoğlu (2007), a high level of anxiety negatively affects students' academic achievement. In their study, Chasanidou et al. (2015) stated that students' course anxiety levels decreased because the design thinking process supported cooperation, and in parallel with this, students' self-confidence increased and they developed a positive attitude towards

the course. Similarly, Güneş and Güneş (2017) stated in their research that "winner and loser" are replaced by "winner and winner" with the use of a cooperative learning method, which positively affects students' cognitive and affective states. In this study, it is thought that the posttest scores of the experimental group students are higher than the control group students' scores due to the decrease in the anxiety of students who cooperated with their classmates in design thinking processes, the increase in their self-confidence, and the development of positive attitudes towards the course.

Regarding the third research question, according to Buchanan (1992), in the design thinking process, solving a problem is entirely related to the internal processes of individuals. In addition, the concept of spatial citizenship modifies this approach by arguing that critical spatial thinking is fundamental for achieving civic empowermen (Mechlenborg & Neergaard 2024). Therefore, in the design thinking process, the ideas generated for solving a problem move on from abstract to concrete. Therefore, this tangible product produced by the end of design thinking processes contains a map of the internal processes of its owner (Cross, 2011). In this study, this state may have influenced the fact that the problem-solving skills of the experimental group students favored the control group students in design thinking processes.

Regarding the fourth research question and the questions in the Interview Questions Form, in a study on design thinking-based education, Scheer (2017), reported that design thinking-based education contributed positively to the improvement of classroom experiences, students' positive attitudes increased towards the course, and even the teachers who used the design thinking approach were effectively motivated toward the practice and prevailed over the chaos and crises they encountered in the classroom environment through design thinking-based education. Kartal (2014), on the other hand, examined the effect of the cooperative learning method on English academic achievement and attitudes and students' views on cooperative learning. As a result, the study determined that using the "student teams-achievement divisions" technique positively improved the experimental group students' attitudes toward English and significantly reduced their course anxiety. In this study, the design thinking method and the cooperative learning method were used together and the "student teams-achievement divisions" technique was employed. Hence, the cooperative learning method could have influenced the views of experimental group students that the design thinking method reduces their anxiety. In their study, Brown and Katz (2019) noted that different problems were encountered in an online design education process and stated that student and educator productivity was limited to technological resources. The present study found that students highlighted the internet-related problems experienced. As such, Park and McKilligan (2018) stated that the applicability of online design thinking education is limited to technological resources, which may negatively affect productivity. Regarding how the design thinking approach affects their problem-solving skills, students' views related to the sub-theme of *positive views* mostly centered on the fact that it *increases creativity*. It has also been

stated by many researchers that the use of the design thinking approach supports creativity in individuals or students (Scheer, 2017; Melles et al., 2012; Sheehan et al., 2018).

According to the findings obtained in this study, design thinking is generally a student-centered educational process that makes students active and provides them with skills like creativity and cooperation, instead of making them passive and directing them to memorization. In this sense, it could be stated that students were satisfied with the design thinking approach. In addition, students' satisfaction may also be because they consider this method an alternative to traditional learning methods and that they are open to innovations in education.

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GENİŞLETİLMİŞ TÜRKÇE ÖZET

TASARIM ODAKLI DÜŞÜNME YAKLAŞIMIYLA ÖĞRETİMİN FARKLI DEĞİŞKENLER BAKIMINDAN İNCELENMESİ

Bu çalışmanın amacı, tasarım odaklı düşünme yaklaşımının ortaokul öğrencilerinin İngilizce öğreniminde kelime öğrenme başarıları, işbirlikli öğrenme ve problem çözme becerileri üzerindeki etkisini araştırmaktır. Bu araştırma, 2020-2021 eğitim-öğretim yılı güz döneminde İngilizce dersi kapsamında Mersin İli Yenişehir ilçesinde bulunan bir ortaokulun 8. sınıfında öğrenim gören deney grubunda 23 ve kontrol grubunda 20 olmak üzere toplam 43 öğrenci ile 8 hafta süreyle gerçekleştirilmiştir. Deney grubundaki uygulama sürecinde, tasarım odaklı düşünme yaklaşımının ortaokul öğrencilerinin İngilizce öğrenimine yönelik kelime öğrenme başarılarına, işbirlikli öğrenme ve problem çözme becerilerine etkisi analiz edilmiştir. Kontrol grubunda ise bağımlı değişkenlerin uyumlaştırılmış öğrenme yöntemiyle kontrol edilmesi nedeniyle tasarım odaklı düşünme yaklaşımıyla tüm uygulamalar aynıdır.

Bu araştırmada nicel ve nitel verilerin bir arada kullanıldığı karma yöntem kullanılmış; karma yöntem yaklaşımlarından müdahale tasarımı kullanılmıştır. Elde edilen niceliksel verileri desteklemek amacıyla nitel verilerden yararlanılmıştır. Nicel verilere ulaşmak amacıyla araştırmacı tarafından geliştirilen "İngilizce Kelime Başarı Testi", Serin, Saygılı (2010) tarafından geliştirilen "Ortaokul Öğrencilerinin İşbirliğine Dayalı Öğrenme Algısı Ölçeği" ve "Çocuklar İçin Problem Çözme Envanteri" kullanılmıştır. Araştırmanın nitel verilerine ulaşmak için araştırmacı tarafından geliştirilen 8 sorudan oluşan "Görüşme Soru Formu" deney grubu öğrencilerine uygulanmıştır. Niceliksel verilerin analizinde IBM SPSS Statistic 17 paket programı kullanılmaktadır. Ölçme araçlarına normallik testleri yapılmış ve yine parametrik testlerin kullanılmasının uygun olduğuna varılmıştır. Gruplar arasındaki farklar için t testi kullanılarak; farklılığa neden olan grupların belirlenmesinde cohen d indeksi kullanılmıştır. Araştırmadan elde edilen nicel verilerin analizi için; İçerik analizi, verileri tanımlamak ve verilerde saklı olabilecek gerçekleri ortaya çıkarmak için yapılır. Araştırmada kodlama güvenirliğini sağlamak için Miles ve Huberman'ın güvenirlik formülü kullanılmıştır.

Araştırmadan elde edilen sonuçlara göre;

Tasarım odaklı düşünme yaklaşımının uygulandığı deney grubu öğrencileri ve bu yöntemin uygulanmadığı kontrol grubu öğrencileri karşılaştırıldığında, kelime öğrenme başarıları, kelime öğrenme son test başarı notları ve kelime öğrenme kazanım puanları incelendiğinde işbirlikli öğrenme algı puanları, işbirlikli öğrenme algı son test puanları ve işbirlikçi öğrenme algısı son test puanlarına göre deney grubu lehine anlamlı bir fark bulunmuştur. Deney grubu öğrencilerinin tasarım odaklı düşünme yaklaşımına ilişkin genel görüşleri incelendiğinde deney grubu öğrencileri lehine anlamlı bir farklılık olduğu,

öğrencilerin genel olarak olumlu görüş ifade ettikleri görülmektedir. Öğrenciler en çok görüşlerini "ezber yapmamak" şeklinde ifade etmişlerdir. Tasarım odaklı düşünme yaklaşımının arkadaşlarla işbirliği içinde hareket etme üzerindeki etkisine ilişkin öğrencilerin "olumlu görüşleri" kapsamında en yaygın olarak "grup içinde iletişim becerisinin arttırılması"; "olumsuz görüşler" teması kapsamında ise en sık "Covid-19 korkusu nedeniyle arkadaşlardan uzak durmak" yer almaktadır. Tasarım odaklı düşünme yaklaşımının problem çözme becerisine etkisi konusunda öğrenciler en çok "yaratıcılığı geliştirmek" yönünde görüş belirtmişlerdir. Ancak tasarım odaklı düşünme yaklaşımını daha etkili hale getirmek için öğrenciler en çok "çevrimiçi ders yapmama" önerisini dile getirmişlerdir.

Sonuç olarak nicel ve nitel verilere ilişkin bulguların birbirini desteklediği bu çalışmada, tasarım odaklı düşünme yaklaşımının deney grubu öğrencilerinin kelime öğrenme başarılarını, işbirlikli öğrenme algılarını ve problem çözme becerilerini olumlu yönde etkilediği ifade edilebilir.