The Effectiveness of the Brain-Based Learning Style Cycle

Şeyma Şahin, Burcu Ökmen, and Abdurrahman Kılıç

Abstract

The purpose of this research was to evaluate the effectiveness of the brain-based learning style cycle. In the research, a pre-test and post-test quasi-experimental design without a control group was used. The research study group consisted of sophomore (2nd year) students studying at Duzce University Faculty of Education, Psychological Counseling and Guidance Department in the fall semester of the 2020–2021 academic year. There were a total of 111 students, 84 females and 27 males. The course was structured according to the Brain-Based Learning Style Cycle. Research data were collected using the "Attitude Scale Towards Cooperative Learning", the "Teacher Self-Efficacy Scale", the "Metacognition Thinking Skill Scale" and the "Student Letters". At the end of the research, it was concluded that the students had positive attitudes towards the model. It was determined that the model created a significant difference in students' attitudes towards cooperative learning, teacher self-efficacy beliefs, and metacognitive thinking skills.

Keywords: Brain-based learning style cycle, metacognition, teacher self-efficacy

Dr. Şeyma Şahin, Teacher, Republic of Turkey Ministry of National Education, Duzce, Turkey can be reached at seyymasahin@gmail.com

Dr. Burcu Ökmen, Teacher, Republic of Turkey Ministry of National Education, Duzce, Turkey, can be reached at burcuokmen91@hotmail.com

Prof. Dr. Abdurrahman Kılıç, Educational Sciences, Duzce University, Duzce, Turkey, can be reached at abdurrahmankilic@duzce.edu.tr

Over time, educators have realized the problems experienced in meeting the needs of different students in heterogeneous and crowded classrooms and the need for alternative teaching approaches (Friedman & Alley, 2010). There has been a shift towards a more "personalized" approach to learning and teaching, and the idea that learning should be tailored to individual needs has emerged (Allcock & Hulme, 2010). As a result of this, the "learning styles" view, which is thought to contribute significantly to academic success and learning products in education today, has come to the forefront, and this view has created a great influence in education at varying levels from kindergarten to graduate school (Cassidy, 2004). The learning style view has been widely used in psychology and pedagogy since the 1930s (Boneva & Mihova, 2012).

It is thought that the learning of the individual is affected by their learning styles, and understanding the learning styles and preferences of the students will provide benefits both to the students and the instructors. It is believed that the individual's knowledge of their own learning style will enable them to manage their learning by using appropriate learning strategies (Awla, 2014; Jaleel & Thomas, 2019). It is also believed that optimal learning requires diagnosing individuals' learning styles and planning teaching accordingly, and that understanding students' learning styles will help teachers plan effective learning environments (Allcock & Hulme, 2010; Pashler, McDaniel, Rohrer & Bjork, 2009). It is also stated that learning environments that are not arranged in accordance with learning styles can cause problems such as absenteeism and dropout (Awla, 2014).

However, there are also some opinions that the validity and reliability of the tools used in determining the learning style are low, and using arbitrary criteria such as median and mean, it is not possible to "cluster" students into different groups. Additionally, some other opinions are that

student self-assessments are not sufficient to evaluate learning styles and that the learning path preferred by individuals will often not be the most effective learning path and will not yield effective results (Dembo & Howard, 2007; Kirschner, 2017). It is also thought that grouping students according to different learning styles and creating teaching activities for each learning style will be difficult and costly, require extra teacher training, and may increase the number of teachers (Pashler et al., 2009).

Unlike these two extreme viewpoints, there are some who believe that environments with a balanced and inclusive approach, covering different learning styles, using cooperative and active learning strategies with different materials and activities, and providing students with multiple experiences will provide effective learning. It is thought that using various teaching styles together in an effective learning environment are an effective way to both reach more students and expand their learning repertoire/styles. It is also thought that to maximize the effectiveness and quality of learning in the planning, implementation, and evaluation processes, it is important to focus on a combination of learning styles, enriching learning by using different ways in the learning process (Darra, 2013; De Vita, 2001; Peacock, 2001; Romanelli, Bird & Ryan, 2009). This view is adopted within the scope of this study. It is thought that rather than identifying the learning styles of students, placing them in a uniform learning style, and narrowing their learning, it is a more beneficial approach to support their versatile development by touching on the different styles they have, and to make their learning skills more comprehensive by revealing their different potential areas.

While the amount of research describing the benefits of learning styles has increased in recent years, ironically, the role of learning styles in practice has decreased in the international community. Unfortunately, in schools all over the world, understanding of learning styles is not

included in education and a uniform approach is adopted (Evans, Cools & Charlesworth, 2010; Wilson, 2012). Academicians in higher education are generally unfamiliar with learning styles approaches; they try to appeal to all students with a single teaching approach. They prefer to stay in their comfort zone and avoid using methods and techniques that utilize different learning styles in learning environments (Hawk & Shah, 2007). In addition to this deficiency in the field, it is seen that the studies on the transfer of learning styles into practice in the international literature are quite limited. Some reasons for this gap in practice are the lack of consensus-based theories, confusing terminology, and the fact that most learning styles are not sufficiently related to practice; therefore, there are uncertainties about how to transfer theory to practice (Allcock & Hulme, 2010; Dembo & Howard, 2007). Similarly, when the literature on learning styles in Turkey is examined, it is seen that there are many survey studies in which students' learning styles are determined, but there are a limited number of studies and examples that will guide the effective implementation of learning styles.

Due to the unavoidable distance education process that the world and our country are faced with, course designs suitable for different learning styles have gained even more importance. In online courses, in order to maximize the learning potential of each student, to create positive effects on student participation and student attitudes, and to ensure effective learning, it is very important to consider different learning styles in the planning of the course and to employ the appropriate methods, techniques, and materials (Battalio, 2009; Speece, 2012; Zapalska & Brozik, 2006). However, even in face-to-face education, there are uncertainties about how to transfer theory to practice. It is clear that how to adapt learning styles to learning in distance education is even more uncertain, and there is no study in the literature on this subject yet.

With this research study, it was aimed to present a learning style model suitable for the distance education process in order to contribute to the role of learning styles in practice and to enrich practice-oriented studies. For this purpose, the "Brain-Based Learning Style Cycle," which has been successfully adapted to distance education, covers different learning styles with a balanced and inclusive approach, supports cooperative and active learning, offers students multiple experiences with different materials and activities, and is based on the learning styles models in the literature, was developed. It is thought that this model will guide applications in all fields, especially those in higher education, and contribute to increasing the quality of education. Among the courses taken by pre-service teachers at universities, the "Teaching Principles and Methods" course can be considered the most comprehensive and important course in terms of gaining teacher competencies. It is very critical for students to acquire the skills and knowledge in this course effectively in terms of their future professional lives. In this context, the application and evaluation of this newly developed model in the "Instructional Principles and Methods" course, which is compulsory at the undergraduate level, was considered. The aim of this research is to evaluate the effectiveness of the brain-based learning style cycle. For this purpose, answers to the following questions were sought:

- What are the student attitudes towards the brain-based learning style cycle?

- What is the effect of the brain-based learning style cycle on students' attitudes towards cooperative learning?

- What is the effect of the brain-based learning style cycle on students' teaching self-efficacy beliefs?

- What is the effect of the brain-based learning style cycle on students' metacognitive thinking skills?

The Learning Style Concept and Its Models

The concept of "learning style" is a term used to express individual differences in learning processes. Kolb (1984) defined learning styles as "the methods individuals use to receive and process information." Grasha (1996) defined it as "the roles of different students during their interaction with classmates, teachers, and course content." Pashler et al. (2009) defined it as "what kind of information presentation individuals prefer and/or what kind of mental activities they find interesting," and Allcock and Hulme (2010) defined it as "adapting teaching and learning." Various researchers have independently worked on different aspects of learning styles and presented various models and theories. Some of these are described below.

Dunn and Dunn (1974) say that learning according to the learning style model is affected by different stimuli. These stimuli are: (1) environmental, (2) emotional, (3) sociological, (4) physiological, and (5) psychological. The combinations and variations between these elements show that very few people learn in exactly the same way. According to this model, environmental stimuli such as sound, light, temperature, and room design affect learning. Elements such as motivation, patience, and responsibility are considered emotional stimuli. Some students prefer to learn on their own, some prefer to learn in groups, and some prefer to work with peers or interact with an adult. All these elements are called "social stimuli." While some students prefer visual pictures or maps while learning, others prefer listening to music, and still others prefer kinesthetic activities. Some students like to eat or drink while learning, while others don't. The time of day also plays an important role in student learning. All these are physiological factors that affect learning. Psychological stimuli include global and analytical learning. Global learners learn better when they focus on the general topic. Analytical learners need to learn all parts of information by putting together small pieces to understand the whole

picture. Also, analytical learners have left-brain superiority while global learners have right-brain superiority.

In the experiential learning model developed by Kolb (1984), learning is perceived as a process. Learning is seen as the process of constructing knowledge and the transfer of pre-existing fixed ideas to the student is opposed. Students are actively involved in the learning process to improve learning. In the learning process, different thinking and problem-solving methods are encouraged. This process includes feedback on the effectiveness of learning efforts. In this model, the learning of individuals consists of four stages in the form of a cycle. These are "concrete experience," "reflective observation," "abstract conceptualization," and "active experience." Four learning styles emerged from the combination of these learning steps in the cycle as "changer," "assimilator," "differentiator," and "placer."

The 4MAT model (McCarthy, Germain, Lippitt, 2002) is a learning cycle developed by Bernice McCarthy in 1980. McCarthy created a pedagogical model based on John Dewey, David Kolb, and Carl Jung's brain research and other works. The model, which is a combination of David Kolb's Experiential Learning Model and Jung's Individuation Theory, is a synthesis of findings about learning styles and right-left brain dominance. According to the model, individuals learn in different but identifiable ways. Learning and transfer are more appropriately encouraged when classroom activities involve personal experience, reflection, association, conceptualization, application, extension, recognition, and integration into learning by systematically using the right and left hemispheres of the brain.

According to the 4MAT model, there are four types of learners. These are imaginative, analytical, common sense and dynamic learners. Imaginative learners seek meaning. They learn by listening and sharing ideas. Analytical learners seek facts and are interested in ideas and

concepts. They want to know what the experts think. Common sense learners seek usability; they want to know how things work. They enjoy hands-on experience and learn by testing theory through practice. Dynamic learners love to explore, learn by trial and error, and enrich reality and diversity.

The model consists of four quadrant steps addressing four different styles, and each quadrant consists of two parts that address the right-left hemisphere features of the brain. Thus, in the first step (connecting) of the model, which consists of eight steps in total, the student is engaged in a concrete experience. Students are provided with an opportunity to establish a relationship between their own lives and the subject area. In the second step (attending), students analyze the experience presented to them and expand their thinking areas by associating it with their own experiences. In the third step (image), which aims to expand meanings, students are encouraged to symbolize their understanding. At the center of this step is creating an image, visualizing it, and picturing the concepts in the mind. The fourth step (inform) is aimed at presenting the knowledge and experience to the students in a complete and systematic way. In step five (practice), students are directed to apply the concepts they have learned, while in step six (extend), students are encouraged to develop their own practice to test the limits and contradictions of their understanding. The seventh step (refine) requires students to critically re-examine newly acquired knowledge and experience. In this phase, students confront and resolve the contradictions in the previous phases. The eighth step (perform) is integration, celebration, and closing. It is the step in which presentations are made, poems are read, letters are mailed, and research reports are presented.

The Brain-Based Learning Style Cycle

The concept of "learning style" is a term used to express individual differences in learning processes. Kolb (1984) defined learning styles as "the methods individuals use to receive and process information." Grasha (1996) defined it as the roles of different students during their interaction with classmates, teachers, and course content. Pashler et al. (2009) defined it as what kind of information presentation individuals prefer and/or what kind of mental activities they find interesting, and Allcock and Hulme (2010) defined it as adapting teaching and learning. Various researchers have independently worked on different aspects of learning styles and presented various models and theories. Some of these are described below.

- A full cycle of the model is completed in two stages. The five steps in Kolb's experiential learning model, which are "concrete experience," "reflective observation," "abstract conceptualization," and "active experimentation," and the six steps in the 4MAT teaching model, which are "connect," "attend," "image," "inform", "practice," "extend," "refine," and "perform," were gathered into six steps in this model. These steps are "creating experiences," "creating meaning," "conceptualization," "application," "analyzing," and "sharing." Thus, the model consisted of six steps under two stages.

- According to brain-based learning, the left and right hemispheres of the brain have different functions, but they work together. Students learn best when their tasks are challenging and the classroom environment is safe and supportive. Emotions are brain-based and play an important role in decision-making. The brain's (or mind's) search for meaning is personal, and the more the learning is related to personal experiences, the deeper the learning will be (Connell, 2009). Accordingly, the model was designed to appeal to both right-brain and left-brain characteristics. Each step of the model includes challenging and interesting tasks for

students. Students' feelings and personal experiences are combined with learning in the "creating experience" and "creating meaning" steps.

- Considering the "social stimuli" in the Dunn and Dunn model, and considering that some students prefer to learn by themselves, some prefer to learn in groups, and some others prefer to interact with an adult, the three steps in each stage were organized as "individual/pair", "group" and "class" work.

- In this way, students will be able to work both individually and in cooperation, and each student will be able to find a place for himself/herself in one of these steps. Cooperative learning has been attempted to allow students to provide social interaction among themselves, to feel responsible for their peers' success, to take more responsibility, put in more effort, and to be more motivated. The first two steps in each stage are performed by the students before the course, and the third step can be carried out face-to-face or online. With these steps, the model can be successfully adapted to distance education.

- Since it is thought that the quality of the learning outcomes obtained by the students is largely determined by the learning activities they participate in, a student-centered teaching/active learning approach has been adopted in the formation of the model. The model is designed in such a way that students are responsible for their own learning and actively participate in the meaning-making processes.

- The model includes the use of methods such as portfolios, self- and peer assessment, and so on in student assessment.

The model is schematized in Figure 1.

Figure 1

The Brain-Based Learning Style Cycle

As seen in Figure 1, the Brain-Based Learning Style Cycle is completed in two stages and six steps. The steps of the model are explained below.

Stage 1. Step 1: This step is the "creating experience" step. Students are expected to create and record personal experiences with the subject, either individually or in pairs, based on their preferences. The teacher's job is to guide them. In this step, which is organized in accordance with the "imaginary" learning style and appeals to the right brains of the students, literary writing techniques such as memoirs, tales, stories, diaries, and conversations are used.

Step 2: This step is the "creating meaning" step. Students are expected to think more deeply as a group about the experiences they create individually and to create meaning by discussing them. The teacher's job is to guide them. In this step, which appeals to the left brains of the students and is organized in accordance with the "imaginary" learning style, discussion techniques such as brainstorming, snowball, opposite panel, opinion development,

argumentation, thinking with six hats, six shoes, circle, speaking ring, Socratic questioning, debate, panel, forum, panel discussion, ball bearing, aquarium, butter-bread, and case study are used.

Step 3: This step is the "conceptualization" step. It is hoped that students integrate the experience and meaning they have created with more information and acquire theoretical knowledge about the concept. In this step, which is carried out with the whole class, the task of the teacher is to give information. This step appeals to both the right and left brains of the students and is organized in accordance with the "analytical" learning style. On one hand, in this step, film-documentary, poetry, drama, painting-cartoon, and music that appeal to the right brain are used. On the other hand, methods and techniques such as narration, question-answer, seminar, conference, symposium, and speech that appeal to the left brain are used.

Stage 2. Step 4: This step is the "implementation" step. In this step, which appeals to both the right and left brains of the students and is organized in accordance with the "common sense" learning style, the students are expected to perform the right and left brain-based activities individually or in pairs and produce products in line with the information they have learned in the first three steps. In this step, the teacher's duty is to guide them. Students are given right-brain tasks such as finding similarities and differences, classification, concept maps, fishbone, mind maps, structured grids, and puzzles, and left-brain tasks such as writing and completing stories, poster preparing, writing acrostics/poems, writing letters, writing dramas, and writing slogans.

Step 5: This step is the "analyze" step. In this step, students are expected to analyze and summarize all their learning in groups. Again, the teacher's job is to guide them. Analysis and

summarization techniques are used in this step, which appeals to the left brains of the students and is organized in accordance with the "dynamic" learning style.

Step 6: This step is the "sharing" step. In this step, which is attended by the whole class, appeals to the right brains of the students and is organized in accordance with the "dynamic" learning style, the students are expected to share the information they have analyzed and summarized with their friends using presentation techniques. In this step, the teacher's task is to evaluate and criticize them.

Method

Research Model

In this research, a pre-test post-test quasi-experimental method without a control group was used. The symbolic view of the pattern is given in Table 1.

Table 1

Pre-test Post-test Pattern without Control Group

	Pre-Test	Process	Post Test
D	O_1	X	O_2

D: Experiment Group, O1: Pre-Test, O2: Post-Test, X: Experiment Process

Study Group

The study group of the research was determined by the "purposive sampling" method. The Teaching Principles and Methods course and the students attending this course were selected as the study group on purpose. The study group consists of second year students studying at Düzce University Faculty of Education, Psychological Counseling and Guidance Department in the fall semester of the 2020-2021 academic year. Of the 111 students, 84 were and 27 were male.

Research Process

The course was structured according to the brain-based learning style cycle. The research lasted for 15 weeks. In the first week, an introduction was made and information about the course was given. The model was put into practice from the second week. The practice courses were held in three different student groups on the same day. The students formed groups of 3-6 people with their friends. There were seven, six, and nine groups among the first, second, and third-year students, respectively. A chairperson was chosen by the students to carry out group work. Each chairperson served for two weeks, and each group member became the chairperson in turn.

Each week, the students first carried out their individual/couple work, and then they carried out their group work at a time and method they determined before the classroom work. The classroom works were scheduled on the live course platform of the university as the first class between 13.00-14.00, the second class between 14.00-15.00 and the last class between 17.00-18.00 every Wednesday. Every Thursday, the students were sent instructions valid for two stages. The instructions were containing the achievements of the unit, the tasks/activities to be performed at each step, the methods and techniques to be used. The students performed the steps of the model sequentially in line with this instruction.

- In the first step, students were asked to write their personal experiences about the subject by using the techniques of memoir, fairy tale, story, diary, and conversation, individually or in pairs, depending on their preferences.

- In the second step, they were expected to create meaning by discussing as a group the experiences they had created individually. For each unit, they were asked to use a different one of the discussion techniques, which are: brainstorming, snowballing,

contrast panel, opinion development, argumentation, thinking with six hats, six shoes, circle, conversation ring, Socratic questioning, debate, panel, forum, ball bearing, aquarium, butter-bread, and case study.

- In the third step, presentations containing videos, poems, acrostics, pictures, cartoons, and music were made by the lecturer in a way that appealed to both the right and left brains of the students. In this step, sometimes, the videos are sent before the course.

- In the fourth step, activities prepared based on both the right and left brain were given to the students in line with their achievements. In each unit, tasks appealing to the right brain such as finding similarities and differences, classification, concept map, fishbone, mind map, structured grid, and puzzles, and tasks appealing to the left brain such as writing/completing stories, preparing posters, writing acrostics/poems, writing letters, drama writing, and slogan writing were assigned to the students.

- In step five, the students were asked to analyze and summarize all their learning in groups.

- In the sixth step, the students shared the information they analyzed and summarized with their classmates. At the end of this stage, students prepared a single report and uploaded it to Google Classroom until 00.00 on Thursdays. The head of the group was responsible for the preparation and sending of the reports.

First of all, a needs analysis was conducted with 13 pre-service teachers, 18 teachers, 2 school administrators, and 14 educational science experts on the data collected from a total of 21 documents, including six international reports, eight international curriculums, four national reports, and three theses. As a result of the analysis of the data, seven modules were created, and the course was conducted according to these modules. These modules are listed in Table 2.

Table 2

The Modules

Weeks	Dates	The Modules
1	Oct. 05-09	Getting acquainted, informing about the course
2	Oct. 12-16	Fundamentals of Learning
3	Oct. 19-23	
4	Oct. 26-30	Course Plan Preparation and Content Creation
5	Nov. 02-06	
6	Nov. 09-13	Principle, Approach, Model, Method, Technical Information
7	Nov. 16-20	
8	Nov. 23-27	Creating a Learning Model
9	Nov. 30 - Dec. 04	
10	Dec. 07-11	Method-Technique, Activity, Material Planning
11	Dec. 14-18	
12	Dec. 21-25	Executing the Learning Process
13	Dec. 28 - Jan. 01	
14	Jan. 04 - 08	Evaluation
15	Jan. 11-15	

Evaluation of the course was done via portfolio, self-assessment, and peer assessment. The reports from the students were evaluated by the researchers, the students were informed about the evaluations, and the reports were stored in the electronic student portfolios. Self and peer-assessment forms prepared by the researchers were filled out by the students at the end of the semester. The evaluation was done with 60% of the portfolio group score, 30% of the peer review score, and 10% of the self-assessment score.

Data Collection

The Attitude Scale towards Cooperative Learning, the Teacher Self-Efficacy Scale, the Metacognition Thinking Skill Scale, and the Student Letters were used to collect research data. Information about each scale is given below.

Attitude Scale Towards Cooperative Learning: The scale consists of 28 items and one dimension was developed by Şahin, Arseven, Ökmen, Eriş & İlğan (2017). It was seen that 28 items explained 45.38% of the total variance. In the internal consistency study of the scale, the Cronbach's Alpha coefficient was found to be 0.95, and the two-half reliability was found to be

0.90. Students who score high on the scale have more positive attitudes towards cooperative learning, while those with low scores have negative attitudes.

Teacher Self-Efficacy Scale: The scale, which consists of 24 items and three dimensions, "Student Participation," "Teaching Strategies," and "Classroom Management," was adapted into Turkish by Çapa, Çakıroğlu and Sarıkaya (2005). The internal consistency coefficient of the scale was found to be 0.93 for the whole scale.

Metacognition Thinking Skill Scale: The scale developed by Tuncer and Kaysi (2013) consists of four sub-dimensions: "Thinking Skills," "Reflective Thinking Skills for Problem Solving," "Decision Making Skills," and "Alternative Evaluation Skills," for a total of 18 items. In the internal consistency study of the scale, the Cronbach Alpha coefficient was found to be 0.88.

Student Letters: A letter was received from each student in which they wrote their positive or negative opinions about the teaching process of the Teaching Principles and Methods course. It is thought that these letters will provide a rich perspective on the students' feelings and thoughts about the teaching process.

Quantitative pre-test data were collected using Google Form between October 12 and 16, 2020, and post-test data were collected using Google Form at the end of the semester between January 21 and 23, 2021.Student letters were collected together with the final reports on January 07, 2021, at the end of the semester. It was observed that all students who took the course wrote and sent letters.

Analysis of the Data

It was observed that the pre-test and post-test scores of the Attitude towards Cooperative Learning Scale were not normally distributed, but the pre-test scores of the Teacher Self-Efficacy Scale and the Metacognitive Thinking Scale were normally distributed. On the other hand, the

post-test scores were not normally distributed. For this reason, in the analyses, the Wilcoxon Signed Ranks Test was used for related measurements from non-parametric tests.

The qualitative data analysis process was carried out in three stages (Kılıç, Aydın, Ökmen & Şahin, 2019) as "organizing", "summarizing" and "associating/interpreting" data. First and foremost, the data were organized and coded as S1, S2,... S111.The content analysis approach was used in summarizing the data. In this analysis process, first the data was coded, then the codes were analyzed and categories were formed. As a result of the content analysis, it was discovered that the data was organized into four major categories: "Learning Steps," "Course Execution," "Evaluation/Feedback/Communication," and "Learning Outcomes."The data were interpreted during the associating and interpretation phases by establishing relationships between the categories.

Validity and Reliability

Cronbach Alpha values were checked to determine the internal consistency coefficients of the scales. The Cronbach Alpha coefficients for the pre-test and post-tests of the scales are given in Table 3.

Table 3

Reliability Coefficients of Scales

	Pre-Test	Post-Test
Attitude Scale Towards Cooperative Learning	0.955	0,955
Teacher Self-Efficacy Scale	0,904	0,951
Metacognition Thinking Skill Scale	0,803	0,879

As seen in Table 3, alpha values of all scales are above 0.80 in both pretests and posttests. Values between 0.80 and 0.95 indicate a high level of reliability (Coaley, 2010; Kline, 1986). In this case, it can be said that each scale is highly reliable.

For the validity and reliability of the qualitative data, both the application and the research part of the study were carried out by the researchers themselves, and a long-term interaction was carried out with the participants. The research process was reported in detail and transparently. The researchers read the data several times, and the categorization processes were meticulously carried out. The relationships between the categories were constantly examined throughout the analysis process, and the findings were meticulously arranged and interpreted. The data was interpreted objectively, and the researcher's tendencies were not reflected in the research. The raw data from the study was stored for future review when necessary.

Results

The results are presented under four headings, which are "Student Views on the Model", "Attitudes towards Cooperative Learning", "Teacher Self-Efficacy Beliefs" and "Metacognitive Thinking Skills".

Student Views on the Model

Student opinions are presented under four headings, "Learning Steps", "Execution of the Course", "Evaluation/Feedback/Communication" and "Course Outcomes".

Learning Steps

It has been observed that students' views on learning steps are grouped under six categories, which are "creating experiences," "making meaning," "conceptualization," "application," "analyzing" and "sharing."

Creating Experiences. Students have positive opinions about the step of creating experiences. They stated that it is pleasant and beautiful, that they develop their imagination, knowledge, and skills in writing techniques, that it increases learning and permanence, and that it draws their attention to the subject by reminding them of their prior knowledge. At this step, it

was observed that the students are satisfied with seeing the achievements in their own experiences and evaluate their own educational lives. On the other hand, it was also observed that some students think that this step gets boring over time.

Meaning Making. At this step, it was seen that the students had positive opinions about the step. They think that they gained knowledge and skills in discussion techniques, reinforced the subject, came to the course ready and gained critical and different perspectives. However, it has also been observed that there are some negative opinions about the techniques: that they are difficult to apply, that they are not suitable for distance education, and that they were not informed about how to apply them.

Conceptualization. Students think that the lecturer's lectures are impressive, the presentations are remarkable and entertaining, far from detailed and clear, and they are easy to understand. They also think that the lectures are effective and efficient, provide permanent learning, were prepared with great effort, and make the students feel valued. It was seen that the students liked the cartoons, poems, short words, and sayings used in the presentations and found them effective. It was also determined that the students thought that the videos used in the presentations and sent home were interesting and entertaining, had a positive effect on learning, opened their horizons, and helped them focus on the course. However, it has also been observed that there are a few students who prefer more didactic and detailed information and think that the visuals are below their level.

Application. It was observed that the students found the activities in this step fun, beautiful, and intriguing. It was determined that the students have positive opinions about this step, which enables them to learn different methods and techniques, increases their learning,

eliminates their deficiencies, and improves their creativity. However, it was also observed that the students found this step challenging and thought that some activities were unnecessary.

Analysis. It was observed that the students thought this step was nice and enjoyable and provided permanence. However, it was also observed that there are students who complain that report writing is time-consuming and tiring, that examples for the report are missing, and that some of their groupmates do not contribute.

Sharing. Students have opinions about this step that it is beautiful and fun, gives them the ability to make presentations and express themselves, provides active participation, increases learning and permanence, and listening to other presentations is beneficial in terms of learning and recognizing their deficiencies. There is also an opinion that evaluating other groups makes them feel important. On the other hand, there are opinions that making presentations is stressful and there are too many presentations.

Execution of the Course

After the analysis, it was seen that the students' views on the conduct of the course were grouped under three categories: "design," "instruction," and "group work".

Design. It was observed that the students think that the model is programmed, systematic, suitable for distance learning, different from other courses, and fun. It was also observed that the students find the model very productive and instructive in terms of learning, and that they think that complete learning takes place and that the information is permanent. Students also think that the model is student-centered and enables them to learn by being responsible for their own learning, by experience, and actively participating. It is also thought that the model is suitable for

daily life, focused on application/production, and although it is difficult at first, it gets easier over time.

However, it was observed that the students thought that the model was intense, time-consuming, and difficult, that the instructors were passive, and that the main burden was on the student. They also think that the model is not flexible, creates anxiety and stress, and does not provide complete and permanent learning. Repetitive, boring, and too detailed are criticisms of the content.

Instruction. It was determined that the students found the instructions effective, useful, and exciting, and thought that they were prepared meticulously. The students stated that the instructions were confusing for them in the first few weeks, but they got used to it in the following weeks. It was also observed that the students find the instructions suitable for individual differences and are satisfied with the options offered. However, it was also determined that the students think that the instructions are not clear and detailed enough, and they complain about the lack of resource suggestions.

Group Work. It was observed that the students were generally quite satisfied with the group work. It was also observed that the students find group work nice and fun, and think that it is beneficial in terms of friendship, communication, socialization, unity, and solidarity. In addition, students also think that group work increases efficiency and learning, provides peer learning, reduces their burden, and provides motivation for learning. It was also observed that students are satisfied with being the president and experiencing leadership. On the other hand, while there are students who think that group work is effective, there are also some students who criticize group work. They think that group work is not productive because it is difficult to come together and make decisions together. They stated that they experience the stress of being

embarrassed in front of the group members and that they have problems due to the irresponsibility of the group members.

Evaluation, Feedback, and Communication

It was observed that students' views on evaluation, feedback, and communication are grouped under three categories: "evaluation", "feedback", and "communication".

Evaluation. It was observed that the students are satisfied with the absence of exams and find portfolio, self, and peer assessment nice and useful. It was determined that the students are satisfied with the fair, timely, detailed, and meticulous evaluations. It is thought that peer evaluation ensures fairness and participation of students in the process. On the other hand, it was also observed that there are students who prefer to take midterm and final exams by taking traditional courses. They stated that they get low grades in this way and that they have grade anxiety.

Feedback. It was observed that the students think that they are given effective feedback, that they realize their mistakes or deficiencies with the feedback, and that they make progress. However, it was also observed that the students complained that the feedback was not clear and unambiguous, that they were given in general, not specific to the groups, and therefore they could not realize their deficiencies and could not complete them.

Communication. It is seen that the students are satisfied with the effort spent on them, showing interest, love, patience, understanding, smiling, creating a democratic classroom environment, giving importance to their thoughts, answering their questions, and the guidance and support provided. However, it was also seen that there were students who complained about

the lack of communication, not answering the questions, giving late answers, or not giving clear answers.

Course Outcomes

It was observed that students' views on course outcomes are grouped under four categories, which are "knowledge," "skill," "attitude" and "value."

Knowledge. Students think that they learned the following information within the scope of the model:

- Fundamentals of Learning: Concepts related to learning, curriculum, constructivist approach, student-centered understanding.

- Learning and Teaching Process: Methods-techniques, teaching principles, teaching models, teaching materials.

- Evaluation: Evaluation techniques, evaluation principles.

Skill. Students think that they acquired the following skills within the scope of the model:

- Professional Skills: Professional experience/teaching, making presentations, preparing course plans/programs, creating content, creating learning designs, using models and techniques, and preparing materials.

- Personal Skills: Getting out of the learning pit, using time effectively, planning, writing, researching, critical thinking.

- Social Skills: Cooperative learning, communication, leadership, and discussion.

Attitude. Students think that they have acquired the following attitudes within the scope of the model:

- Professional Attitude: Understanding the importance of the plan/program, student-centered/constructivist approach, positive attitude towards students, understanding the importance of individual differences, positive attitude towards teaching.

- Personal Attitude: Gaining self-confidence, realizing its potential, realizing the power of thought.

- Social Attitude: Understanding the importance of group work.

Value. It was observed that the students think that they gained the values of responsibility, tolerance, non-judgment, understanding and compromise, respect for differences, patience, and unity as a result of the application of the model.

Attitude Towards Cooperative Learning

Wilcoxon Signed Ranks Test pre-test and post-test results showing students' attitudes towards cooperative learning are given in Table 4:

Table 4

Wilcoxon Signed Rank Test Pre-test and Post-test Results

Factor		N	Mean Rank	Sum of Rank	z	p
Total Score	Negative Rank	28	32,59	912,50	-3,650	,000
	Positive Rank	54	46,12	2490,50		
	Equal	5				
	Total	87				

When Table 4 is examined, it is seen that there is a significant difference (z =-3.650, p =0.000) between the students' attitude scale towards cooperative learning pre-test and post-test scores.

Teacher Self-Efficacy Belief

Wilcoxon Signed Ranks Test pre-test and post-test results showing students' teacher self-efficacy beliefs are given in Table 5.

Table 5

Wilcoxon Signed Ranks Test Pre-test and Post-test Results

Factor		n	Mean Rank	Sum of Rank	z	p
Total Score	Negative Rank	20	29,53	590,50	-5,425	,000
	Positive Rank	65	47,15	3064,50		
	Equal	5				
	Total	90				
Student Participation	Negative Rank	18	29,64	533,50	-4,618	,000
	Positive Rank	56	40,03	2241,50		
	Equal	16				
	Total	90				
Teaching Strategies	Negative Rank	18	37,00	666,00	-4,367	,000
	Positive Rank	60	40,25	2415,00		
	Equal	12				
	Total	90				
Class Management	Negative Rank	18	31,39	565,00	-5,181	,000
	Positive Rank	63	43,75	2756,00		
	Equal	9				
	Total	90				

When Table 5 is examined, it is seen that there is a significant difference in the favor of the post-test between the students' Teacher Self-Efficacy Belief Scale pre-test and post-test scores. The differences are ($z=- 5.425$, $p=0.000$) in total scores, and ($z= -4.618$, $p=0.000$) in student participation, ($z= -4.367$, $p=0.000$) in instructional strategies, and ($z= -5.181$, $p=0.000$) in classroom management sub-dimensions.

Metacognitive Thinking Skills

Wilcoxon Signed Ranks test pre-test and post-test results showing students' metacognitive thinking skills are given in Table 6:

Table 6

Wilcoxon Signed Ranks Test Pre-test and Post-test Results

Factor		n	Mean Rank	Sum of Rank	z	p
Total Score	Negative Rank	26	29,40	764,50	-3,620	,000
	Positive Rank	50	43,23	2161,50		
	Equal	7				
	Total	83				
Thinking Skill	Negative Rank	29	36,83	1068,00	-1,033	,302
	Positive Rank	41	34,56	1417,00		
	Equal	13				
	Total	83				
Reflective Thinking Skills for Problem Solving	Negative Rank	24	28,92	694,00	-3,369	,001
	Positive Rank	47	39,62	1862,00		
	Equal	12				
	Total	83				
Decision Making Skill	Negative Rank	25	28,26	706,50	-1,904	,057
	Positive Rank	37	33,69	1246,50		
	Equal	21				
	Total	83				
Alternative Evaluation Skill	Negative Rank	19	29,61	562,50	-4,047	,000
	Positive Rank	51	37,70	1922,50		
	Equal	13				
	Total	83				

When Table 6 is examined, it is seen that there is a significant difference in favor of the post-test between the students' Metacognitive Thinking Skills Scale pre-test and post-test scores. The differences are (z =-3.620, p =0.000) in total scores, and (z =-3.369, p =0.001) in reflective thinking skills towards problem-solving, and (z =-4.047, p =0.000) in alternative evaluation skills sub-dimensions. Although there are increases in students' scores in thinking skills (z = -1.033, p = 0.302) and decision-making skills (z = -1.904, p = 0.057) sub-dimensions, these increases are not significant.

Conclusions and Discussion

The results of the research can be summarized as follows:

- It was concluded that the students generally have positive attitudes towards the "creating experiences," "making meaning," "conceptualization,", "application," "analyzing," and "sharing" steps of the model, and each of these steps is effective.

- It was observed that the students generally have a positive attitude towards the design of the model, but it was also observed that they think that it is difficult and time-consuming.

- It was found that the students think that the model is student-centered, enables them to learn by actively participating and experiencing, and is application/production-oriented.

- It was determined that the students find the instructions effective and useful, but they want them organized in a more understandable and detailed way.

- The students were found to be generally pleased with their portfolios, as well as their self- and peer evaluations.

- It was found that the students think that the feedback helps them to develop and progress by making them realize their mistakes and deficiencies, but they have difficulty recognizing their deficiencies because the feedback is given in general.

- It was observed that the students are satisfied with the effort being spent on them, showing interest, love, understanding, smiling, creating a democratic classroom environment, and the guidance and support provided to them, but some students think that they have communication problems.

- It is seen that the model has a positive effect on students' attitudes towards cooperative learning. It was concluded that the students generally find group work fun, beneficial in

terms of communication and solidarity, and that they think that different ideas increase learning and productivity.

- It was observed that the model had a positive effect on students' teacher self-efficacy beliefs in total and in the "student participation," "teaching strategies," and "classroom management" dimensions. It was also observed that the students gained information about the basics of learning, the learning-teaching and evaluation processes, and professional skills such as preparing a course plan, making a program, creating content, creating a learning design, and preparing materials.

- It was seen that the model positively affected students' metacognitive thinking skills in total and in "reflective thinking towards problem solving" and "alternative evaluation" dimensions.

- It was observed that students gained personal skills such as writing, research, critical thinking, planned work, and effective use of time, and social skills such as communication, leadership, and discussion.

- It was concluded that the students gained positive attitudes in professional, personal, and social fields.

- At the end of the course, it was determined that the students gained values such as responsibility, tolerance, respect, and patience.

It is thought that various features of the model have a combined effect on its success. Explanations and discussions on these features are given below.

Model Steps: It is thought that the use of various teaching styles together, with a balanced and inclusive approach, and the model steps that include activities for right and left-brain characteristics contribute positively to the effectiveness of the model. In support of this idea,

Usta (2006) found in his study that activities based on learning styles created significant differences in students' achievements and attitudes. Güven (2007) also concluded that activities based on learning styles have significant contributions to students in terms of achievement, attitude towards the course, and permanence of what has been learned. Abu-Ameerh (2014) also concluded in his research that learning styles affect students' metacognitive thinking skills.

Individual/Group/Class Works: Within the scope of the model, the result of individual study before the class is effective. This is supported by several studies in the literature showing that the pre-class work increases the active participation of the students in the course and the success of the course (Akgün & Atıcı, 2017; Arslan & Kuzu, 2019; Frydenberg, 2012; Herold, Lynch, Ramnat & Ramanathan, 2012; Ökmen, 2020; Ronkainen, 2015; Stone, 2012; Talbert, 2012; Yamane, 2006).

It is thought that cooperative group studies have a great contribution to the effectiveness of the model. Studies show that the cooperative learning approach increases student achievement (Meral & Şimşek, 2014; Nam & Zellner, 2011; Ökmen, 2020; Shy-Jong, 2007; Subba (2014) and their motivation (Arısoy, 2011; Ökmen, 2020). Harianto, Rusijono, Masitoh, and Setyawan (2020) and Hurst, Wallace, and Nixon (2013) think that social interaction between students in courses improves students' critical thinking and problem-solving skills. The results of studies done by Bashir, Nisar and Gul (2020), Carpenter and Pease (2013), Cecchini, Fernandez-Rio, Mendez-Gimenez, Gonzalez, Sanchez-Martínez and Carriedo (2020), Redes (2016), and Sawyer and Obeid (2007) indicated that collaborative studies improved students' social skills, sense of responsibility, self-esteem, and confidence. Kılıç and Şahin (2017) concluded that cooperative learning activities allow students to exchange ideas with each other, provide peer guidance to students who have difficulties, and enjoy working in groups.

From the research, it is concluded that the presentations made in the classroom are effective. This result is supported by a study done by Göçer. Göçer (2008) stated that the presentations made by the students gave them the experience of speaking in front of the public, let them be active in the classroom and in the social environment, and helped them be effective as individuals with the determination to succeed.

Student-Centered/Active Learning Approach: It can be said that being suitable for student-centered and active learning approaches is very important for the model to be effective. Supporting this result, studies done by other researchers show that student-centered and active learning approaches positively affect students' attitudes towards the course ((Baş, 2009; Kılıç & Şahin, 2016; Koç & Demirel, 2004; Platt, Raile & Yu, 2014; Topan, 2013), increase student motivation (Sırakaya, 2017; Su & Cheng, 2015; Yıldırım & Demir, 2016), increase students' academic achievement and permanence, and provide depth in understanding (Kılıç & Şahin, 2016; Maden, Durukan & Haigh, 1997; Smart & Csapo, 2007; Topbaş & Toy, 2007). In addition, in student-centered education, students' attitudes are positively affected by teachers' being tolerant towards their students, respectful of their rights and personalities, unbiased, open to discussion, guiding, helpful, and consistent in democratic behaviors (Yağcı, 1998). Students find the course challenging and time-consuming because they take responsibility for their own learning. Making students experience the complexity, difficulties, and real problems of daily life is one of the requirements of student-centered education. In student-centered education, it is attempted to reveal each student's strengths and increase the level of critical thinking by assigning students challenging tasks to complete collaboratively (Şahin, 2020).

Evaluation System: It is thought that the model's evaluation system is also effective in its success. In support of this research, Asturias (1994), Birgin (2008), Barton and Collins (1997),

Dut-Doner and Gilman (1998) and Klenowski (2000) stated that the portfolio method encourages students to learn, enables them to actively participate in the evaluation process, gives them the opportunity to evaluate themselves and see their shortcomings, and enables them to take responsibility for learning. They also emphasized that it is a communication tool between the teacher and the students. Similar to the results of this study, Çevikbaş and Argün (2016) concluded that facilitating and encouraging feedback positively affected student self-esteem, while Bayat (2010) concluded that self- and peer-evaluation activities reinforced students' learning and positively affected their self-confidence.

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