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ORIGINAL ARTICLE

Evaluation of ARCS-Based Motivational Design Thinking (M-DT) Education*

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Ethical Statement
This research was carried out after obtaining approval from the "Gazi University Rectorate Ethics Committee" and official permissions (Scientific Research Ethics Committee's Decision No. E.1195002 dated 13.03.2025). Each stage of the study was carried out in accordance with research and publication ethics. An informed consent forms were signed by the participants to indicate their voluntary participation.

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Conflict of Interest
No conflict of interest is present in the conduction or the reporting of this study.

ABSTRACT

The aim of this study is to determine the opinions of prospective teachers regarding the "Motivational Design Thinking (M-DT)" (Turkish: M-TOD) training designed and implemented based on the ARCS instructional design model. The opinions of 10 prospective teachers who participated in the M-DT training were examined in the study. The research data were collected with a semi-structured interview form consisting of open-ended questions prepared by the researchers. The data obtained from the interview form were analyzed with content analysis and descriptive analysis techniques used in qualitative research. As a result of the interviews, findings were reached regarding the individual perceptions of prospective teachers regarding design and design thinking, the stages they had difficulty and were successful in the M-DT training process, their active participation throughout the process, the advantages of the M-DT training process, their feelings and thoughts throughout the education process and their suggestions for an effective M-DT training. This study is original research that aims to fill a limited qualitative gap in the literature regarding the design thinking training planned with ARCS-based instructional design.

Keywords: design thinking, ARCS, instructional design, motivation, prospective teachers

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INTRODUCTION

“We cannot solve our problems with the same thinking we used when we created them.” Albert Einstein

In the 21st century, especially technological developments have differentiated the skills that individuals need to have. Thus, innovative thinking skills, problem solving skills, creativity and innovation skills that individuals need to make a difference have come to the fore. With these developments, the skills that young people need to have in the future and the problems they need to solve are becoming less predictable day by day. Since uncertain (bad / unknown) and complex problems arise from unexpected and unknown future situations and are different from the usual ones, they cannot be solved with traditional methods (Camillus, 2008). For this reason, 21st century educational environments should be responsible for developing students' skills such as creative thinking, problem solving and entrepreneurship so that they can solve uncertain problems arising from uncertain future situations.

Design thinking (DT) involves defining the problem and empathizing with problem solving, identifying problems and generating creative solutions, and is a powerful tool to meet the needs of 21st century students (Carroll, 2015). It is a human-centered, creative, iterative, practical and innovation-oriented approach (Brown, 2008). This approach is an effective method for generating innovative solutions (Liedtka, 2015). It can be defined as an innovative problem-solving approach. The process consists of five basic stages: Empathy, Problem, Ideas, Prototype and Test (Plattner et al., 2011).

Design thinking advocates argue that students should be taught to think like designers to develop their creativity and better understand the innovation process (Retna, 2015). The qualifications that prospective teachers gain and the teaching methods they know are extremely important for both their personal development and the benefits they will provide to their students when they practice their profession. In this context, it is important for teachers and prospective teachers to know the design thinking approach and to be able to teach it to their students.

There are many studies examining design thinking in educational environments. In studies conducted with preschool, primary school, secondary school students and teachers, it has been observed that design thinking has a positive effect on the development of participants' creative self-confidence (Carroll et al., 2010; Grammenos & Antona, 2018; Rauth et al., 2010; Wise, 2016). Design thinking is defined as a learning model that supports design creativity by using a project- and process-based learning process where creative confidence is at the forefront and has an impact on the ways students participate in the learning process (Carroll et al., 2010). In this learning model, it is important to support students' motivation for active participation in the process.

Design thinking practices develop creative and critical thinking when applied in a fun, peer-guided, project-oriented and active learning environment (Dorland, 2022). In today's educational environments, teachers need to be not only individuals who convey information, but also creative problem solvers and guides. In the context of changing student profiles and varying learning needs, it is a great necessity for prospective teachers to receive DT training. DT supports both the professional development of prospective teachers and enables them to produce innovative solutions in course design and classroom management. In addition, teachers' transfer of the DT approach to their students contributes to the development of students' skills such as creative thinking, collaboration and empathy. Thus, students grow up as more prepared and enterprising individuals for the uncertain world of the 21st century. Therefore, it is of great importance for prospective teachers to receive DT training and to convey this approach to their students in terms of both individual and social development.

The ARCS Model is a motivational instructional design model that helps educators design learning experiences that increase student motivation. The ARCS model, developed by Keller (1987), includes four basic dimensions: Attention, Relevance, Confidence, and Satisfaction, which aim to increase learning motivation. In this model, the learning process is planned with the goals of attracting and maintaining the learner's attention, ensuring that learning materials and activities are aimed at the learner, ensuring that the learner believes that they can achieve success, and ensuring that the learner is satisfied with the learning process. It has been observed that instructional processes designed with the ARCS model have positive effects on student participation (Reynolds et al., 2017). In learning processes that require active participation, the ARCS model can support the participants' motivation for learning.

In the literature, it is seen that the studies addressing the participant views on design thinking teaching processes designed based on ARCS motivational teaching theory are limited. In this context, focusing on the experiences of prospective teachers who participated in the design thinking process developed based on ARCS aims to fill an important gap in terms of the design of teaching programs for teacher education. Design thinking training designed with the ARCS model can have a significant impact on student engagement and learning.

This study aims to deeply examine the experiences of prospective teachers regarding the Motivational Design Thinking (M-DT) process structured based on ARCS theory. The main problem of the research was determined as follows: “What are the opinions of prospective teachers who received ARCS-based Design Thinking training regarding the process?”

In line with this basic problem, the questions of the research are as follows:

1. How do prospective teachers define the concepts of design and DT?

2. In which stages of the M-DT process do prospective teachers have more difficulty, and in which stages do they feel more successful?

3. In which stages of the M-DT process do prospective teachers participate more actively, and in which stages do they participate less?

4. What advantages does receiving M-DT training provide to prospective teachers?

5. What emotions do prospective teachers experience during the M-DT process?

6. According to prospective teachers, how should effective DT training be?

METHOD

Research Design

In this study, which examined the participants' views on the Motivational Design Thinking (M-DT) Traning process designed based on the ARCS Motivational Instructional Design Model, a qualitative research method was used. To describe the participants' views on the M-DT process in detail, the research was conducted in accordance with the case study model, one of the qualitative research designs. A case study is a research method that allows for an in-depth examination of a specific phenomenon or event (Yıldırım & Şimşek, 2018). In the study, the perceptions of the prospective teachers about the process, the emotions they experienced, the difficulties they encountered, the suggestions for the process, their successes and the gains they achieved were descriptively presented.

Setting and Participants

The study group of the research consists of prospective teachers (n= 10) who are studying in the first and second year at the Faculty of Education of a state university in Ankara and taking the “Motivational Design Thinking Training” (M-TOD) in the spring and autumn term of the 2023-2024 academic year. When it is seen that the opinions collected from the participants are repeated during the interviews, the reach data saturation decision should be made by the researcher (Yıldırım & Şimşek, 2018). Data saturation was reached with the opinions of 10 participants, and the research was completed. Details about the demographic characteristics of participants are shown in Table 1.

Table 1. Findings on the demographic characteristics of the participants.

Variables		*n*	%
Gender	Male	4	40
	Female	6	60
	Total	10	100
Age	20	5	50
	21	3	30
	22	2	20
	Total	10	100
Nation	TR	9	90
	Foreign	1	10
	Total	10	100

Participants were coded and numbered from P1 to P10. One of the participants, P5, has a different profile as a student who does not normally attend school but only participates in this training process. This situation was seen as positive in terms of motivation and commitment in the context of the process. In addition, P10 is a foreign student, and his views were evaluated in terms of the participants forming homogeneous groups and group cooperation.

As shown in Table 1, most trainers that we interviwed were female, comprising 60% (n=10) of the sample. Additionally, 50 % (n=5) of the trainers were 20 years of age or older. In terms of nations, 90% (n=9) are Turkish Student, while 10% (n=1) is from out of Turkic republic (out of Türkiye).

Implementation and Data Collection Tool

While planning a Design Thinking training based on the ARCS model, it was aimed to both increase the participant's motivation for learning and ensure their active participation in the learning process. The “Motivational Design Thinking Training” (M-DT) instructional design process was planned with the Motivational Design: 10-Step Model (Keller, 2000) based on the ARCS Instructional Model developed by Keller (1987). In addition, the M-DT process was structured based on the ARCS Motivational Strategies (Keller, 1987) and the 4 principles of the ARCS Model. The training process lasted 9 weeks, including the Sustainable Development Goals (SDG) Week, DT process weeks (empathy, problem, ideas, prototype, test), and the presentation of the projects. The students were asked to develop a project compatible with the sustainable development goals and to make a project presentation with their group members at the end of the training.

"M-DT evaluation interview form" was prepared as a semi-structured to determine the opinions of prospective teachers about the M-DT training. While preparing the form, the researchers first conducted a literature review, and a

draft form was created by writing 8 open-ended questions in the context of the research questions. The researchers received opinions from three field experts (curriculum specialist, instructional design specialist, design thinking trainer, lecturer) about the draft form, and one question was removed because it was like the other questions in line with the experts' opinions. In addition, to determine the approximate answer time of the questions and to test the comprehensibility of the questions, the form was applied to a student who was outside the scope of the research, and the form was finalized as there were no problems.

One-on-one interviews were conducted with the participants and data was collected. Through interviews, in-depth information about the motivational design thinking training that the participants attended was collected. The interviews were conducted by researchers and audio-recorded and transcribed.

Data Analysis

To increase internal validity in case studies, it should be clearly stated how the results were reached and the evidence regarding the inferences should be presented in a way that other people can access (Yıldırım & Şimşek, 2018). For this purpose, descriptive analysis was performed in the analysis of the data, and the direct statements of the participants were included. In the descriptive analysis technique, the data can be organized according to the themes revealed by the research questions and can also be presented by considering the questions and dimensions used in the interview and observation process (Yıldırım & Şimşek, 2018). Participant views were described for descriptive analysis.

The data were categorized and interpreted for content analysis. In the first stage of the category process, open coding was performed, codes were created and organized into thematic structures. The codes were named with the terms closest to the participant expressions. To increase reliability, care was taken to ensure consensus between the two coders. When the codings made by the coders were compared, it was seen that consensus was reached on 17 of the 20 codes. In this direction, the consensus rate between the coders was calculated as 85%. This rate is above the 80% reliability threshold suggested by Miles & Huberman (1994). Differences of opinion between the coders were resolved through detailed negotiations and consensus meetings, and at the end of this process, the final coding set was created. Present information about your data analysis. You may change the heading titles in accordance with your study.

Compliance with Ethical Principles

The research was conducted with the approval of the ethics committee. Informed consent forms were obtained from the participants before the interview, and the data was coded and reported.

FINDINGS

1. Findings Regarding Design and DT

During the interviews, the participants stated that before starting the training, they defined the concept of design more as “visual arrangement”, “aesthetic creation”, artistic product and “related to appearance”.

Table 2. Table of perception content analysis towards design

Theme	Codes	Participants
Design	Aesthetics / Visuality / Artistic Product	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10
	Problem solving process	P3, P4, P5, P6, P7, P8 P9
	Planning, systematic process management	P1, P2, P3, P5, P9, P10

At the end of the training, they stated that the concept of design is not limited to visuality; it is a systematic way of thinking that is directly related to the problem-solving process, planning and creative thinking.

P3, "I learned that design is not just about appearance but also work done to solve a problem."

P5, "I realized that design is not just about aesthetics, but about every stage of the process."

P9, "I saw that planning a process is also part of design."

Table 3. Perception content analysis table for Design Thinking

Theme	Codes	Participants
Design Thinking	It is a complex process	P1, P2, P4, P7, P10
	It encourages creativity	P3, P4, P6, P8, P9
	It requires collaboration	P7, P9, P10, P6
	It is a gradual process	P1, P3, P6, P8
	It is empathy-oriented	P1, P2, P4, P5, P6, P7, P8, P9
	It is a problem-solving process	P3, P9, P10
	It is based on hands-on learning	P2, P3, P8

The participants' perceptions of DT changed during the process; while it was insufficient and uncertain at the beginning of the training, awareness of the approach emerged, became clearer and deeper with comprehension during the application process. Expressions that were appropriate for the structure of DT were reported as opinions after the training.

P1, stated that the gradual structure facilitated the comprehension process by saying, "As I saw what we were going to do step by step, I understood its content better." (Graduality)

P2, stated that he could not internalize the method at the first stage by saying, "I did not understand what it would do at first, but it made sense as I applied it." (Uncertainty)

P6, stated that the stages became concrete in the application by saying, "Everything was clearer at the end of the process." (Graduality)

P9, "It was unknown at first, but now I think it is a method that I can use to solve problems." (Problem-solving process)

P10, "When I was presenting the prototype, I said that we all actually designed everything." (Collaboration)

2. Findings on Challenges and Successes in the DT Process

According to the participants, the most difficult stage in the Design Thinking (M-DT) process was prototype. This is because the resources, time and skills required to transform their ideas into a tangible product are limited. The difficulty of empathy and test stages is mostly highlighted by the lack of planning and the inability to create a communication strategy. The difficulty of the idea stage stemmed from the need to produce distinctly different ideas (creativity).

Table 4. Difficulties in the M-DT Process Content Analysis

Stages	Difficulty	Participants
Empathy	Inability to decide what to ask, how to proceed	P2, P3
Problem	Inability to clarify the problem, disagreements	P1, P4, P6

Idea	Difficulty in creativity, repetitive ideas	P6
Prototype	Difficulty in turning the idea into a tangible product Insufficient materials and time Lack of technical knowledge (drawing, use of digital tools) Indecisiveness in planning, uncertainty in the implementation process	P7, P8, P9, P10
Test	Lack of planning feedback	P1

P8: "I couldn't convey my thoughts. I couldn't do what I wanted, I couldn't make it concrete... I wanted it to be a real, concrete product."

P10: "I had difficulty with prototyping... I don't know TinkerCAD very well... I can't draw the design in 3D... I had difficulty because I couldn't do it."

Table 5. Content Analysis Table Regarding Successes in the M-DT Process

Stage	Reason of Success	Participants
Prototype	Concrete product creation, self-confidence, task sharing	P2, P3, P4, P5, P6
Idea	Creativity, contribution, active participation	P7, P10, P2
Empathy	Connecting with the immediate environment, emotional significance	P1, P8, P9
Problem	Empathy, easy problem recognition	P8
Test	Feedback, seeing the solution work, success	P4, P10

According to the participants' statements, the feeling of success in the Design Thinking (DT) process; producing a concrete product, collaboration within the group, self-confidence gained at the end of the process, creative thinking, efficient progress of the process, empathy, receiving meaningful feedback and emotional significance.

Prototype is the stage where the greatest sense of success is experienced. Participants mentioned the self-confidence gained from producing a product, concrete task sharing within the team and visualization success. Some participants felt successful in the idea stage, as it was the stage where they felt most creative and comfortable. Participants stated that they felt successful in this stage because they were able to connect with the target audience and found the process meaningful in the Empathy and Problem stage. Receiving feedback and feeling close to implementing the solution in the Test stage motivated the participants.

P4: "I received feedback when I had it tested. I felt like I was producing something. I said we were successful."

P10: "It was nice to see that the solution worked in testing."

P2: "I think we were successful in the prototype stage. Because everyone put forward ideas, everyone did a certain stage."

P3: "I did something. I have something in my hand... it gave me some self-confidence."

P5: "I wrote a program... I contributed immediately when my friends needed help. This made me feel good."

P6: "I had never done it before, but I made a 3D drawing. Everyone liked it. I gained self-confidence."

P7: "Idea went very well. We presented it very well together and completed it."

P10: "We realized the university's shortcomings in idea stage and looked for solutions."

P8: "The target audience was students like me. I felt comfortable both in empathy and in defining the problem.

3. Findings regarding the Participation Process

Participants' participation levels in the M-DT process varied according to their individual interests, competencies, group dynamics, and roles within the group.

Most Active Stages

According to the participants' opinions, the idea stage, brainstorming, stood out as the most active stage because it was an area where everyone could contribute and provided an atmosphere of creative thinking where ideas were freely shared within the group. The empathy stage was seen to be more actively participated by some participants because it required interviewing, observation, environmental awareness and communication skills. Prototyping stood out for participants who liked to produce concrete products and had technical skills. Problem definition, some participants easily contributed to this application due to their similarity to the target audience (students).

Table 6. Content analysis table regarding the active stages in the M-DT process

DT Stages	Reason	Participants
Idea	Creative contribution, brainstorming, feeling comfortable	P1, P2, P8, P10
Empathy	Interviewing, observation, emotional connection	P3, P6, P9, P4
Prototype	Technical skills, product creation, visualization	P5, P6, P7
Problem	Directing the process with target audience knowledge	P5, P9

P2 “Everyone said something in that part (idea), no one remained silent. I contributed very comfortably.”

P3 “I did the interviews in empathy; I was very comfortable.”

P5 “I coded the prototype anyway. Since I had the technical work, I was there more. When I produced something, I participated more in the process.”

Less Active Stages

According to some participants in DT process, the reasons for falling behind in some stages were lack of technical knowledge, lack of interest, time pressure, late involvement in the process or feeling inadequate.

Table 7. Content analysis table for less active stages

DT Stages	Reason	Participants
Test	Confusion in feedback, difficulty interpreting	P2, P5, P6, P8
Prototype	Technical inadequacy	P3, P9
Problem	Sense of confusion, difficulty defining the problem	P1, P7
Empathy	Shyness (Interview)	P10

The test stage was indicated by many participants as the least active application. This was associated with the lack of clear structure for the application and difficulty interpreting feedback. Prototype was an application that was left in the background for some participants due to technical difficulties. Problem was a stage where some participants had difficulty participating in the process due to the ambiguity of the subject. The empathy stage was a process that some participants hesitated to do due to the need to communicate and language proficiency.

P2 “I was not very active in the test part; the feedback was a bit confusing.”

P3 “Other friends handled prototype part, I did not know the program, I did not do much.”

P1 “I had difficulty defining the problem, I had not made such a definition before. It was confusing.”

P10 “I did not talk much in the empathy interview, I just listened.”

4. Advantages of DT

According to the participants, M-DT training has various advantages for them. Participants emphasized that their self-confidence increased, their entrepreneurial aspects developed, they thought more systematically and critically, they could empathize, their environmental awareness increased, and they could produce creative solutions at the end of the training.

Table 8. Content analysis table for the advantages of M-DT for participants

Theme	Advantage/Contribution	Participants
Self-Confidence	Success, Creative Confidence, thought that I can	P1, P4, P9, P10
Entrepreneurship	Courage to Develop Ideas, New Beginning	P1, P4, P6
Systematic Thinking	Planning Stages, Realizing Deficiencies	P5, P8, P9
Critical Thinking	Product Evaluation, Development Perspective	P1, P3, P6, P9
Empathy & Awareness	Social Sensitivity, Desire to Produce Solutions	P1, P3, P6
Curiosity & Perception	Observation, Increased Attention, Openness to Learning	P1, P4, P6, P10

P10, “I feel like I can do it, not I can’t do it… Now I make an effort, I act with self-confidence.” (Self-confidence)

P1, “It developed my entrepreneurial spirit a little more. It brought creativity and self-confidence together.” (Entrepreneurship)

P5, “It was good to divide the process into steps. It helps with planned problem solving in real life.” (Systematic Thinking)

P8 “Taking this training now will help me go step by step in future assignments.” (Systematic Thinking)

P9 “I noticed invisible problems; there were things that could be contributed to. I can look at situations more critically now.” (Critical Thinking)

P3 “When I talked to someone close to me, I really wanted to produce solutions. I worked for sustainable development.” (Social Awareness)

P6 “My empathy has improved. I started to pay more attention to people’s problems.” (Empathy)

P1 “There were times when I tried to be more sensitive to others. I realized that when I did an interview.” (Social Awareness)

P10 “My perceptions have been opened... I learned how to conduct an interview. When someone tells me something, I say “yes”, I listen, I am curious about what they will say next... I want to know and learn what they will say...” (Curiosity and Perception)

P4 “We have them tested, they tell us our shortcomings, we focus on them more, I felt like I was taking a step towards success.” (Self-confidence)

Many participants stated that the M-DT process provided 21st century skills such as creativity, empathy, communication and problem solving. P1 emphasized her development in self-efficacy by saying, “I was saying I couldn’t

do it, but in this process, I saw that I could."

The training made a significant contribution to the participants' creative self-confidence. The fact that the students' individual contributions were valued within the group made them feel more competent academically and socially.

5. DT process feeling analysis

Many of the participants openly expressed that they felt feelings such as anxiety, shyness, uncertainty and alienation at the beginning of the M-DT process because they did not have sufficient knowledge about this learning approach. The uncertainty and anxiety experienced at the beginning gave way to confidence and happiness with the interaction and production experienced in the process; and finally, it resulted in satisfaction and self-confidence. As the process progressed, a significant positive transformation was experienced in the participants' feelings towards the M-DT application. The anxiety experienced at the beginning gave way to feelings such as interaction, participation, pleasure, curiosity, sense of accomplishment and satisfaction. When the M-DT process was completed, a significant increase in self-confidence, sense of accomplishment, satisfaction and even hope for the future was observed in the participants' emotional world. The products obtained at the end of the process; in-group experiences and presentations show that the participants did not see this training as just a lesson but also considered it as an opportunity for self-realization.

Table 9. Content analysis table regarding the emotional states of the participants during training process

Theme	Feeling	Participants
Start	Anxiety / Fear / Intimidation	P1, P6, P10
	Uncertainty / Incomprehension	P3, P4
	Curiosity / Expectation	P2, P5, P7, P9
Process	Enjoyment / Fun	P3, P4, P6
	Collaboration / Interaction /	P2, P4, P8, P9
	Motivation / Contribution / Active Participation	P5, P6
	Difficulty / Fatigue / Technical Difficulty	P3, P6, P10
Result	Self-confidence / Success	P1, P3, P5, P6
	Pride / Satisfaction	P2, P4, P9
	Partial Satisfaction / Incomplete But Valuable	P8, P10

P1, "the stages were daunting at first".

P3, "we didn't know what to do at first".

P6, "I was nervous because it was my first time doing something practical".

P2, "I was wondering what would happen every week".

P7, "we didn't know how far we could go with our design, but we were encouraged".

This situation also shows that some individuals are not shy towards innovation, but open to discovery. Many participants emphasized that they actively participated in applications such as idea generation and prototyping and that they enjoyed these processes.

P6, expressed the feeling of inadequacy due to technical deficiencies by saying "I don't know TinkerCAD very well, I had a hard time" and the satisfaction of success by saying "everyone liked it in the presentation, it felt good".

P3, expressed both self-confidence and a sense of ownership when he said, "I have a product in my hand, I can

show it."

P10, "There were shortcomings, but our ideas were good, it was satisfying to see the result."

The participants' emotional states evolved from negative to positive throughout the M-DT process. This emotional change shows that M-DT is an effective teaching method not only in terms of cognitive but also affective gains.

6. Recommendations for an effective M-DT Instructional Design

When the end-of-process interview records where the participants evaluated the effects of M-DT training were examined, it was seen that they offered suggestions on how an effective motivational teaching design should be. These suggestions were described with descriptive analysis and structured as themes, subthemes and codes through content analysis; findings that overlapped with the components of teaching process, instructor approach, learning environment and educational gains were revealed.

Table 10. Content analysis table regarding the participants' suggestions for an effective M-DT design

Theme	Sub-Theme	Codes	Participants
Process	Phased structuring	Confidence, Facilitator	P2, P3, P7, P8
	Working with real problems	Interest	P1, P9, P10
	Visibility of project process (web page)	Active participation	P1, P6, P10
Instructor approach	Positive approach	Courage	P1, P6, P8
	End-of-lesson feedback	Satisfaction	P10
	Musical welcome	Motivational starter	P7, P8
Learning environment	Group work	Fun, Developmental	P3, P4, P6, P10
	Digital visual tools	Attention	P3, P4
	Updating content with feedback	Value	P7, P10

In terms of the training process, many students emphasized that the step-by-step, visible learning stages were reassuring. P8 said, "We learned step by step, which reduced my fears," while P2 stated that the gradual nature of the process was "facilitating." Participants such as P10 and P16 stated that they participated more actively in the process when they followed the web page during the project process and knew which stage they were in. Participants such as P5 stated that they became willing to produce solutions within the context of sustainable development goals.

The instructor's approach emerged as one of the most impressive aspects of the training that needed to be improved. P8 stated that she was encouraged by "our teacher's speeches, interest and the lessons she started with music." P10 emphasized that the feedback process created satisfaction by saying, "I was very pleased that our opinions were received at the end of the lesson and reflected in the next lesson."

In terms of the learning environment, students found group work effective and requested a more collaborative environment. P3 and P6 stated that producing together was both fun and developing. In addition, P4 stated that "integrating digital tools like Padlet into the lesson increased their interest."

CONCLUSION AND DISCUSSION

In this study, the effects of Design Thinking (DT) training structured based on the ARCS Motivational Teaching Model on prospective teachers were examined qualitatively. As a result of the analysis based on the interview records, it was observed that the training process, in which many applications corresponding to the four basic components of the

ARCS model (Attention, Relevance, Confidence, Satisfaction) were integrated, had positive effects on the participants. With the successful training process carried out in the study, results were obtained that are consistent with the results of studies (Dorland, 2022) showing that DT supports different thinking, creative practice, critical thinking and student learning and clearly demonstrates that DT is no longer just for designers.

While the participants' thoughts about DT were uncertain and anxious at the beginning of the process, at the end of the process, it changed to a gradual, applied and complex problem-solving process that puts creativity, collaboration and empathy skills to work.

According to the participants, the most difficult stage was prototype. The reason for this is that the resources, time and skills required to transform ideas into a physical product are limited. Empathy and test stages stand out with problems such as lack of direction, lack of planning, and inability to create a communication strategy.

The stage where participants feel the most success is prototype. At this stage, the self-confidence of creating a product, concrete task sharing within the team, and visualization made the participants feel successful. Then, the idea stage was seen to be the stage where they felt the most creative and comfortable.

According to the participants, the stage where they were most active was the idea stage. In this stage, the fact that there was an area where all group members could contribute to the creative thinking environment established freely in the brainstorming and that it did not require material support supported active participation. Then, it was seen that some participants participated more actively in activities such as interviewing and observation during the empathy stage. While some participants showed a high level of participation, especially in the idea, empathy, and prototype stages, some remained less active in the test, problem, or prototype stages.

According to the participant views, the test stage was stated as the least active application by many participants. The reasons for the participants being the least active were stated as receiving feedback for the first time, limited task definition, difficulty in interpreting feedback, and lack of a clear structure regarding the application. Prototype, on the other hand, has been observed to be a practice that has been left behind for some participants due to lack of technical knowledge.

As a result of the study conducted by Carroll et al. (2010), at the end of the DT training process, students stated, 'I can do it if I put my mind to it.' Similarly, it has been observed that M-DT training provides an increase in self-confidence among its advantages. The M-DT process has created a significant transformation in the emotional world of the participants. Negative emotions such as anxiety and uncertainty, which were frequently expressed at the beginning, have been replaced by positive emotions such as curiosity, participation, fun and cooperation during the process. As the process progressed, the participants became more motivated as they interacted with group work and felt more a part of the process thanks to the experience of producing products together. In particular, the stages of idea, prototype and empathy were at the center of the emotional transformation. At the end of the process, feelings of self-confidence, sense of accomplishment, satisfaction and pride came to the forefront. In addition to just producing a project, the participants also discovered their own potential. This shows that the DT approach is a powerful teaching strategy that supports not only cognitive but also affective development. Similarly, according to the views of the participants in their studies (Zhang et al., 2018), it was observed that positive emotions such as pride, satisfaction and joy increased during the design process. In addition, in a project-based learning study conducted for undergraduate engineering faculty students, it was observed that the students' soft skills improved (Kuppuswamy & Mhakure, 2020).

To understand that learning can be "stimulating" and "inspiring", it is first necessary to accept the basic and complementary functions of both emotion and cognition (Wong, 2007). According to the views of the participants in their studies (Zhang et al., 2018), it was seen that joy facilitated their participation just before finding a design idea. In this study, the participants' emotions were examined throughout the learning process. According to the participants' views, it was seen that the learning environment that supported the desired positive emotions was designed by the researchers.

According to the participant views on the features that an effective M-DT design should have, in education; the stages should be clear and visible (trust), the instructor should support the process individually and emotionally (attention, trust), it should be integrated into daily life with problem-focused learning (relevance), each participant should feel that they contribute (satisfaction), the process should be shaped with feedback (satisfaction), different learning styles should be supported with online tools and alternative presentation techniques. Participants stated that the education provided a learning experience that attracted their attention, allowed them to establish meaningful connections with their own lives, increased their self-confidence and provided a high level of satisfaction. Progressive learning processes, the encouraging approach of the instructor, feedback culture, practical studies and product-focused activities came to the forefront in terms of motivational gains.

The findings obtained reveal that the ARCS model offers not only a theoretical framework in instructional design but also a strong structure that can be applied in practice for DT. The increase in the participants' "I can do it" perception, the continuity in their interest in the course, the personal and professional connections they established with the content and the product-focused feelings of success support this situation. In this context, many elements such as musical greetings, games, and visual narratives that appeal to the attention component; real-life problems, padlet applications, and sustainability themes that appeal to the relevance component; staged project design, prototyping, testing, and individual attention from the instructor that appeal to the creative self-confidence component; and presentations, feedback, and a sense of accomplishment that appeal to the satisfaction component have been integrated into the process.

In particular, the instructor's approach to the participants and the space provided to the student in the process have been evaluated by many participants as an element that increases learning motivation.

RECOMMENDATIONS

1. Structuring in accordance with the ARCS model: DT training can be structured based on the ARCS model and include applications that attract students' attention, sustain their interest, support their self-confidence and strengthen their sense of satisfaction at each stage.

2. Gradual and visible learning process: As participants often emphasize, project processes can be designed step by step and in a visible manner; each student can clearly see where they are in the process.

3. Trainer attitude: The trainer can take on the role of a facilitator who not only conveys information but also supports the student's courage throughout the process, maintains individual interest and takes feedback into account.

4. Feedback system: Since it increases students' active participation in the learning process, feedback received at the end of the lesson can be integrated into subsequent lessons.

5. Real-life problems and social themes: To strengthen the relevance dimension of education, associations can be made with themes such as sustainability, accessibility, climate and city life.

6. Digital tools and technologies: Both individual production (weekly tasks) and group sharing can be supported with tools such as padlet (digital board) and web page, and the use of digital skills can be encouraged.

7. Product and presentation-focused closure: A physical or digital product presentation can be provided at the end of the process to reinforce students' motivational commitment.

M-DT Training supports prospective teachers to develop creative and effective solutions to in-class problems. Similarly, in their studies (Girgin, 2019; Sarıkoç & Ersoy, 2022), teachers who participated in the DT process pointed out that the process developed students' cognitive skills such as creative thinking, problem solving and analytical thinking. In addition, the M-DT process, structured based on the ARCS model, increases prospective teachers' learning motivation and strengthens their participation in the process.

This study is limited to the opinions of Computer Education and Instructional Technology Department prospective teachers. The study can be repeated with prospective teachers in different departments and other grade levels.

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