

Received: March 8, 2018

Revision received: July 1, 2018

Accepted: August 20, 2018

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www.estp.com.tr

DOI 10.12738/estp.2018.3.0068 • 2018 • 18(3) • 673–700

Research Article

Modeling the Relationships between School Administrators' Creative and Critical Thinking Dispositions with Decision Making Styles and Problem Solving Skills*

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Abstract

The aim of this study was to modeling the relationship between of school administrators' creative and critical thinking dispositions in relation to their decision-making styles and problem solving skills. A total of 586 school administrators participated in research from a district selected through the random sampling method. Data was collected using four different scales; Decision Making Styles Scale, Social Problem Solving Inventory-Short Form, Marmara Creative Thinking Dispositions Scale and Marmara Critical Thinking Dispositions Scale. A theoretical model was proposed to determine the relationship patterns between the research variables and the proposed theoretical model was tested using a structural equation model. The school administrators' critical and creative thinking dispositions were both predicted decision-making styles and problem solving skills; moreover, it was determined that rational, avoidant and spontaneous decision-making styles significantly predicted the problem-solving skills of school administrators. The school administrators' critical and creative thinking dispositions also effected their problem solving skills by way of their decision making styles (e.g., rational, avoidant and spontaneous). In addition, the school administrators' creative and critical thinking dispositions, along with their decision-making styles (e.g., rational, avoidant and spontaneous), constituted 45% of the change observed in their problem solving skills.

Keywords

Critical thinking • Creative thinking • Problem solving • Decision making

* This paper was derived from the doctoral dissertation by Mustafa Özgenel conducted under the supervision of Prof. Dr. Münevver Çetin.

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Citation: Özgenel, M. (2018). Modeling the relationships between school administrators' creative and critical thinking dispositions with decision making styles and problem solving skills. *Educational Sciences: Theory & Practice*, 18, 673–700. <http://dx.doi.org/10.12738/estp.2018.3.0068>

In the modern era, schools can be seen as sub-systems of educational systems and new developments in the field of science and technology can influence these schools, ultimately compelling change. As a result, schools need to be managed effectively in order to oversee potential changes as well as produce successful educational services which in the end is what is expected from schools. In this context, the effectiveness of the school depends on the desired level of administrative, educational and organizational goals (Başaran, 2000). The achievement of these aims also depends on the fact that school administrators play an active role in the process of change (Levent, 2014), that they understand any situation consists of more than one component (Bolman & Deal, 2013), that they explain the change in a realistic and complete manner (Özden, 1999) and that they are knowledgeable and skilled in administrative processes such as problem solving and decision making (Erdoğan, 2014). In other words, the roles expected from school administrators at the time of change differ (Çelik, 2002) and the behaviours of the administrators become crucial for success in this process (Hansson & Andersen, 2007). School administrators are expected to have certain qualifications and to use administrative processes effectively in order to create successful and quality schools (Hoy & Miskel, 2012).

The success of the administrator in the management of schools means that schools, which are the key strategic and indispensable part of the education system, become successful in specific terms and that the education system is successful in general terms (Aytaç, 2013). Successful administrators are found behind successful and effective schools because school administrators play a vital, key, and multi-faceted role in important administrative matters such as goal setting, effective school practices, and school development (Balcı, 2013; Davis, Hammond, LaPointe, & Meyerson, 2005). For example, the success of each school and student in the Finnish educational system, which according to the internationally ranked PISA exam, was ranked at the top of the Organisation for Economic Co-operation and Development (OECD) countries, is a result of the talented administrators and teachers that make up the Finnish educational system (OECD, 2013).

School administrators who are expected to manage schools effectively, take on this responsibility day-in, and day-out are often faced with a variety of unique and difficult decision-making and problem-solving situations. Professional practices such as management always include decision-making and problem-solving activities (Adair, 2007). For this reason, the administrators are regarded as a problem solver and a decision maker (Açıklım, 1995). In other words, the most important features that make administrators successful are their success in decision-making and problem solving skills (Daft, 2015; De La Bedoyere, 1995; Kepner & Tregoe, 1995; Rogers & Blenko, 2007). School administrators decision-making and problem solving skills play an important and central role in the development and change of schools (Lunenburg & Ornstein, 2013), decision-making is considered a process that affects the functioning

and quality of all managerial processes (Güçlüoğlu, 1985; Kaya, 1986; Lunenburg & Ornstein, 2013; Melman, 1958), is at the heart of management (Bursalioğlu, 2012; Bush, 2007; Simon, 1979), and a part of the brain and nervous system function (Daft, 2015). Making decisions requires goal setting, selection and evaluation of alternative actions, finding an appropriate action, and paying appropriate attention (Simon et al., 1987). Making the right decisions for the benefit of the organization is a distinguishing feature of successful administrators and organizations (Rogers & Blenko, 2007) and conducting effective and efficient administrative processes depends on the administrators' ability to make decisions (Bursalioğlu, 1975).

Decision-making, defined as a process of choosing among two or more alternatives (Azuma, Daily, & Furmanski, 2006; Goldstein, 2013; Hodgetts, 1997; Lunenburg & Ornstein, 2013; Robbins & Judge, 2013; Smith & Kosslyn, 2014) is one of the most basic, toughest and risky tasks of school administrators (Hammond, Keeney, & Raiffa, 2001; Tortop, 1990), because their decisions influence all the sub-systems of the school (Lunenburg & Ornstein, 2013). In the decision-making process, administrators acquire habits from different experiences and these habits constitute their decision-making styles (Nas, 2010). Decision-making styles are a way for the decision maker to interpret and evaluate their decision-making style choice, reaction and ultimate decision-making. The decision-making styles can vary according to different circumstances, and since they are learned habits, different decision-making styles can be applied to different decision-making situations (Brousseau & Driver, 2005).

The decision-making styles that administrators use affect the right decisions they make. Therefore, these reflect the performances and effectiveness of these managers. In addition, the right decision choices help the administrator solve the problems correctly (Vroom, 1973). Sungur (1997) considered administration as a problem-solving process, and according to Erdem (2012) and Erdoğan (2014), the success of the administrator depends largely on their success in the problem-solving process. In other words, problem solving is one of the success criteria of school administrators (De La Bedoyere, 1995; Iskender, Yaman, & Albayrak, 2004). Problem solving acts as a way to remove obstacles encountered when reaching an objective (Smith & Kosslyn, 2014). School administrators need to have problem solving skills in order to be able to effectively and accurately solve the problems which may prevent a school from attaining its goal. Problem solving skills are a tool that help change behaviour and facilitate social competence as well as psychological adjustment. However, problem-solving skills have also been seen as solely activities to understand problems, produce effective solutions and find ways to deal with them (D'zurilla & Goldfried, 1971).

Decision-making and problem solving are similar to other complex cognitive processes (Smith & Kosslyn, 2014). According to D'Zurilla and Nezu (2010)

problem solving is a general coping strategy. Decision-making is the process of choosing between alternatives and according to these definitions, there is no real need for problems to be decided. However, if there is a problem, you have to make decisions at every step along the way of solving the problem (Nas, 2006). When a choice is needed, the decision-making process begins with the problem-solving processes in order to overcome emerging obstacles (Swartz, Fischer, & Parks, 1998). In the problem solving process, the school administrator must make many decisions and each decision ultimately requires other decisions and problem solving activities (Mert, 1997). According to Paul and Elder (2013) ineffective or inaccurate decisions cause other problems but these problems can be prevented if effective and correct decisions are made from the outset. For this reason, the decisions made by school administrators affect the overall problem solving process.

School administrators need to think creatively to produce novel and different ideas and think critically to evaluate those ideas so that they can use problem-solving skills and decision-making styles successfully and effectively in the process of problem-solving and decision-making (Baum-Combs, Cennamo, & Newbill, 2009). Creative thinking is the development or invention of a novel, useful, original and aesthetic product or idea (Presseisen, 1984). Critical thinking is the ability to identify, analyse, and assess the information required for an action or decision (Watson & Glaser, 2012). At this point, creative and critical thinking can be regarded as inter-related (Hoy & Miskel, 2012; Faux, 1992; Fraley, 2008) and two complementary types of thinking. The inter-relationship between creative thinking and critical thinking can be seen in these terms, for example, creative thinking is about producing and discovering while critical thinking is related to the process of judgment and evaluation. As a result, creative thinking relies upon the evaluation skill of critical thinking, and critical thinking relies on the open mindedness and flexibility skills of creative thinking (Lai, 2011).

Creative thinking is a thinking skill that reveals itself in all areas of life, and as a result, must not be restricted to only the fields of art and science (Özözer, 2007). Creative thinking can also be seen as the starting point of innovation. As part of the process of change, innovations achieved through creative thinking (Ergün, 2007) provide a global competitive advantage and can bring success to an organization (Agbor, 2008; Burkus, 2014). Individuals, groups and organizations using an outcome or product of creative thinking have an advantageous position which can provide important benefits to an individual's personal life, to their own work as well as to other people resulting in an increase in the quality of life of society as a whole (Isaksen, Dorval, & Treffinger, 2011). Since creative thinking involves going beyond the usual ways of thinking (Robinson, 2008: 157) to produce new and useful ideas for the solution of a problem and to develop an idea that is produced, as well as, to predict results (Fisher, 2000; Robbins, Decenzo, & Coulter, 2013), explain results

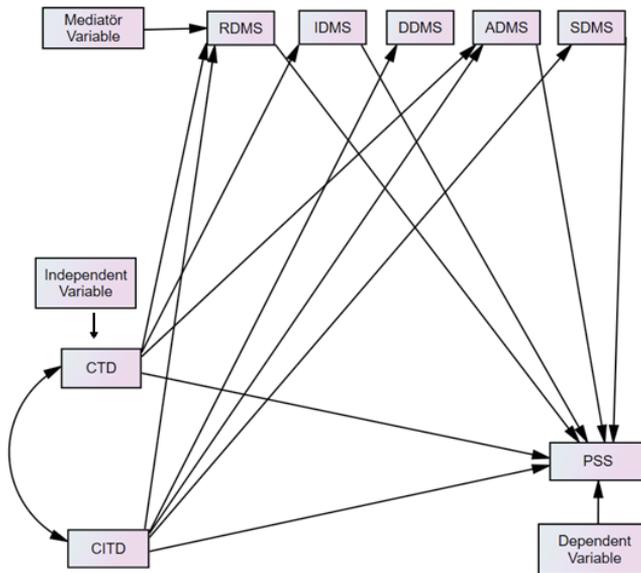
(Fisher, 2000), provide different alternatives and decisions to problems (Tok & Sevinç, 2010), and increase the positive attitude of individuals and instill the courage to solve problems (Evans, 1991). It improves problem solving and adaptation skills (Basadur & Basadur, 2011) and it also helps to improve the quality of the results of a decision and the effectiveness of a problem solving activity (Evans, 1991). In this context, it can be said that creative thinking has important contributions to the problem-solving skills and decision-making styles of school administrators.

Creative thinking is of great importance but school administrators also need to focus on thinking critically. Nowadays, critical thinking is becoming more and more important because information has gained significant power through its increasing complexity, overall expansion and as the driver of change (Doğanay, 2006; Ormrod, 2015). As a result, throughout educational, management and professional circles, there is a rapidly increasing need for individuals with the requisite critical thinking skills (Kurnaz, 2013; Paul, 1990). Critical thinking as a powerful and emancipatory force in one's personal and social life (Facione, 1990), is a cognitive process that helps individuals to better understand themselves and their environment (Özden, 2011). In other words, it allows the individual to consider and contemplate their own thinking (Dombaycı, Ülger, Gürbüz, & Arboynu, 2011; Nosich, 2012). By teaching individuals to consider alternatives and explore contradictions and probabilities (Moeller, Cutler, Fiedler, & Weier, 2013), critical thinking gains effective problem solving skills (Paul & Elder, 2013), helps make the right decision (Lipman, 2003) and increases the rationality of decisions and solutions (Paul & Elder, 2013). Since critical thinking enables the decision-making process to be processed consciously and in a planned manner (Bruning, Schraw, & Norby, 2014; Paul & Elder, 2013) it affects all the decisions we make (Nosich, 2012). Critical thinking determines the content and dimensions of the problem in the problem solving process, reveals the ideas and views about the solution (Paul & Elder, 2013), removes knowledge from personality, directs it to the method and discussion (Kökdemir, 2003a), facilitates the realization of processes (Akar, 2007), provides the enlightenment necessary to solve the problem as well as prevents problem solving from being reduced to a simple process (Paul & Elder, 2013).

Higher order thinking skills such as creative and critical thinking are needed to make effective and correct decisions and to solve problems successfully. Thinking skills are not cognitive processes that are independent of each other, conversely, cognitive activities act as a whole (Demircioğlu, 2012; Şendağ, 2008). For example, individuals can think critically while solving problems and develop reasons while thinking critically, solve problems while thinking creatively, or think critically while making decisions (Kurnaz, 2013). In other words, criticism can be done creatively and creative works can be analysed with a critical approach (Sternberg, 2009). The fact that individuals have creative and critical thinking skills does not mean that they use

these skills. At the same time, it is expected that they will also have the dispositions to use their thinking skills. Thinking dispositions are defined as the tendency to use existing skills (Facione, Giancarlo, Facione, & Gainen, 1995) and as the wish to do something under certain conditions (Ennis, 1987). School administrators can develop their personal and professional skills by reflecting on their creative and critical thinking dispositions to decision making styles (e.g., rational, intuitive, avoidant, spontaneous, dependent) and problem solving skills. They can also positively contribute to solving problems effectively and making the right decisions. They can cope with the negative emotions posed in problem and decision-making situations, and they can also increase their degree and quality of change and development.

When the research literature was examined it was possible to locate several studies which addressed the relationship between creative thinking and critical thinking (Baker et al., 2001; Faux, 1992; Kelly, 2003; Murphy, 1999; Pereira, 2014; Yang & Lin, 2004), creative thinking and decision-making (Isaksen & Aerts, 2011; Mumford et al., 2010), creative thinking and problem solving (Afshar, 2017; Chang, 2013; Deininger, Loudon, & Norman, 2012; Houtz & Selby, 2009; Heppner & Petersen, 1982); critical thinking and decision-making (Barile, 2003; Fan, 2016; Hill, 1999; Pereira, 2014), critical thinking and problem solving (Barile, 2003; Faux, 1992; Sullivan, 1973; MacPherson, 1997), and decision-making and problem solving (Morera et al., 2006; Noppe, Yange, Webb, & Sheng, 2013; Srimadevi & Saraladevi, 2016).



CTD: Creative Thinking Dispositions, CITD: Critical Thinking Dispositions, RDMS: Rational Decision Making Style, IDMS: Intuitive Decision Making Style, DDMS: Dependent Decision Making Style, ADMS: Avoidant Decision Making Style, SDMS: Spontaneous Decision Making Style, PSS: Problem Solving Skills.

Figure 1. Proposed structural equation model.

In light of the research literature that was previously mentioned, it is clear that there is an established theoretical relationship between creative thinking, critical thinking, decision-making and problem solving. In the direction of this relationship, a model was proposed to determine the pattern of explanatory and predictive relationships between school administrators' creative and critical thinking dispositions, decision-making styles and problem solving skills (See Figure 1).

In the proposed Structural Equation Model presented in Figure 1, both the dispositions of critical and creative thinking are categorized as independent variables. While decision-making styles are considered as both dependent and mediator variables according to their critical and creative thinking dispositions. However, decision-making styles are categorised as independent variables according to their problem-solving skills. In the proposed model from Figure 1, problem-solving skills were categorised as dependent variables. In other words, in the proposed Structural Equation Model, there is a two-way predictive relationship (PR) between the critical and creative thinking dispositions (independent variables), a one-way PR between the critical and creative thinking dispositions (independent variables) with problem solving skills (dependent variables) both directly and indirectly through decision-making styles (mediating variables), direct and one-way PR between critical and creative thinking dispositions (independent variables) with decision making styles (dependent variable), as well as, a direct and one-way predictive relationship between decision making styles (independent variables) and problem solving skills (dependent variable).

As a result, the aim of this research was to reveal the explanatory and predictive relationships patterns between school administrators' creative and critical thinking dispositions, and their decision making styles (e.g., rational, intuitive, avoidant, spontaneous, dependent) and problem solving skills. According to [Senge \(2014\)](#) for developing a school system, first, the thinking models of individuals must be examined. There are very few studies relating to school administrators that have focused on the creative thinking dispositions, critical thinking dispositions, decision-making styles, problem solving skills and the relationship among the different combinations of these variables. The studies focusing on these variables have mostly been conducted on students and teachers. In this research, the aim was to present a mind map, picture or appearance that described and predicted the pattern of these variables. In this context, the correct interpretation of the presented information was thought to be helpful in recognizing, understanding and interpreting the variables of creative and critical thinking dispositions as well as the decision-making styles which were considered to impact school administrators' problem-solving skills. In the context of considering the leadership role of this research, explanatory and predictive relationships patterns between school administrators' creative and critical thinking dispositions, and their decision-making styles and problem-solving skills

were expected to provide insight for the researchers and practitioners in the field of educational administration, contribute to the understanding and development of school administrators, as well as, hopefully inspire future research that can be conducted with a variety of other variables.

Method

Research Model

This research proposed a theoretical model to explain the relationship between school administrators' creative and critical thinking dispositions, and their decision making styles (e.g., rational, intuitive, avoidant, spontaneous, dependent) and problem solving skills. In addition, the suggested model was tested through Structural Equation Modelling (SEM) which tests theoretical models by explaining the relationship between the models variables (Hu & Bentler, 1998). In other words, the structural equation model tests the suitability of the data obtained by the researcher according to the proposed theoretical model.

Population and Sample

The population for this research was made up of 2837 school administrators (e.g., principals and assistant principals) who worked in public schools (e.g., primary, secondary and high schools) affiliated with the 13 districts which make up the National Education Directorate located on the Anatolian side (e.g., on the Asian continent) of the city of Istanbul, Turkey during the 2015-16 academic years (Istanbul.meb.gov.tr/23.03.2016). Among the 13 districts located within the Anatolian side of Istanbul considered in this study, 586 administrators working in state schools affiliated with the Kadıköy, Üsküdar, Pendik, Tuzla and Sultanbeyli districts of the National Education Directorate were selected through random sampling methods. The sample size analysed in the Structural Equation Model (SEM) depended on the complexity of the proposed model, the number of variables, the selected model and method of analysis, and whether the data were normally distributed or not, which affected the statistical power and information obtained (Barrett, 2007; Bentler & Bonett, 1980; Brown, 2006; Kline, 2011). Also, the maximum likelihood estimation method was chosen in this study. In addition, Schermelleh-Engel, Moosbrugger, and Müller (2003), stated that a sample size of 400 or more is sufficient for use with the maximum likelihood estimation method. According to the preferred method for this study, it was decided that the number of school administrators participating in the survey was sufficient in terms of the sample size.

The composition of the sample of school administrators was 27.8% (163) from Pendik, 20.8% (122) from Sultanbeyli, 13% (76) from Kadıköy, 24.2% (142) from Üsküdar and 14.2% (83) from Tuzla province. Furthermore, 49% (287) of the

participants were school principals and the other 51% (299) were assistant principals. Among the school administrators, 21.7% (127) were female and 78.3% (459) of them were male. Additionally, 4.4% (26) of them graduated from colleges, 60.4% (354) were university graduates, 34.3% (201) had Master's degrees and 0.9% (5) had earned PhD degrees. At the time of the research study, 34.3% (201) of the participants were working in primary schools, 25.3% (148) in secondary schools, 7.8% (46) in Imam Hatip Secondary Schools, 9.7% (57) in Anatolian High Schools, 15.4% (89) in Vocational High Schools, and 7.5% (44) in Imam Hatip High School. The length of their work experience at the time of the study was, 41.8% (245) working for 1-5 years, 21.3% (125) working for 6-10 years, 13.8% (81) working for 11-15 years, 10.8% (63) working for 16-20 years, 6.7% (39) working for 21-25 years, and 5.7% (33) is working for 26 years or more.

Data Collection Tools

For the data collection tools the Administrator Information Form, Decision Making Styles Scale, Social Problem Solving Inventory-Short Form, Marmara Creative Thinking Disposition Scale and Marmara Critical Thinking Dispositions Scale were used in this research.

Decision-Making Styles Scale. The Decision-Making Styles Scale was developed by [Scott and Bruce \(1995\)](#) to determine individuals' decision-making habits as well as individual differences in decision-making. Also, the Decision-Making Styles Scale (DMSS) was adapted to Turkish, and later validated and reliability checked by [Taşdelen \(2002\)](#). The DMSS utilises a five point Likert scale design with "Strongly disagree" (1), "Disagree" (2), "Undecided" (3), "Agree" (4), and "Strongly agree" (5). The DMSS consists of 25 items and five sub-dimensions (e.g., rational, intuitive, dependent, avoidant, spontaneous) and the total score on the scale cannot be obtained.

Social Problem Solving Inventory. Developed by [D'Zurilla and Maydeu-Olivares \(1995\)](#), the Social Problem Solving Inventory (SPSI) was revised by [D'Zurilla, Nezu, and Maydeu-Olivares \(2002\)](#). The SPSI was adapted to Turkish by [Çekici \(2009\)](#) as well as the validity and reliability analyses conducted. The Social Problem Solving Inventory-Short Form (SPSI-SF) consists of 25 items and five sub-scales (e.g., positive tendency toward problem, negative tendency toward problem, rational, avoiding and inattentive style) in total. The items are rated using a five point Likert scale with "Not at all appropriate" (0), "Not very appropriate" (1), "Partially appropriate" (2), "Very appropriate" (3), and "Completely appropriate" (4). The total score of each sub-scale can be obtained as well as the overall total score of the scale. The lowest score taken from the scale is 0, and the highest score is 100. A high score indicates that the social problem solving skills are "at a good level" and a low score indicates a "low level" of social problem solving skills. There is no item recoded on

the scale and in order to obtain a total score of each sub-dimension, it is sufficient to collect the scores of the items entered into that sub-dimension. However, in order to total the overall score from the scale, a special formula must be applied.

The Marmara Creative Thinking Dispositions Scale. The Marmara Creative Thinking Dispositions Scale was developed by the researcher to determine the creative thinking dispositions of school administrators. The scale consists of 25 items and 6 sub-dimensions (e.g., self-discipline, innovation search, courage, curiosity, suspicion and flexibility). The scale uses a five point Likert type scale which includes “Never” (1), “Rarely” (2), “Occasional” (3), “Generally” (4), and “Always” (5). The lowest score for the scale is 25, while the highest possible score is 125. The higher the person scores on the scale, the higher becomes their disposition to think creatively. All of the items in the Marmara Creative Thinking Dispositions Scale are scored positively.

The Marmara Critical Thinking Dispositions Scale. The Marmara Critical Thinking Dispositions Scale was developed by the researcher to determine school administrators’ critical thinking dispositions. The scale consists of 28 items and 6 sub-dimensions (e.g., reasoning, searching for evidence, reaching judgements, searching for the truth, open-mindedness, being systematic). The scale is a five 5 point Likert type scale including “Never” (1), “Rarely” (2), “Occasional” (3), “Generally” (4), and “Always” (5). The lowest score from the scale is 28 while the highest score possible is 140. The higher the score on the Marmara Critical Thinking Dispositions Scale indicates the higher the disposition to think critically, and all of the items on this scale are scored positively. The calculated Cronbach-Alpha reliability coefficients for the scales used in this research are provided in Table 1.

Table 1
Cronbach-Alpha Internal Consistency Coefficients of Scales

Scales	Cronbach-Alpha Internal Consistency Coefficients
Creative Thinking Dispositions (CTD)	$\alpha = 0.936$
Critical Thinking Dispositions (CITD)	$\alpha = 0.943$
Rational Decision Making Style (RDMS)	$\alpha = 0.783$
Intuitive Decision Making Style (IDMS)	$\alpha = 0.818$
Dependent Decision Making Style (DDMS)	$\alpha = 0.778$
Avoidant Decision Making Style (ADMS)	$\alpha = 0.884$
Spontaneous Decision Making Style (SDMS)	$\alpha = 0.855$
Problem Solving Skills (PSS)	$\alpha = 0.806$

As seen in Table 1, the reliability coefficients for the scales used in this research ranged from 0.77 to 0.94. According to Özdamar (2016), $0.75 < \alpha < 0.85$ high, $\alpha > 0.85$ is perfectly safe. According to the reference ranges given, these scales were believed to be high and perfectly reliable.

Collection of Data

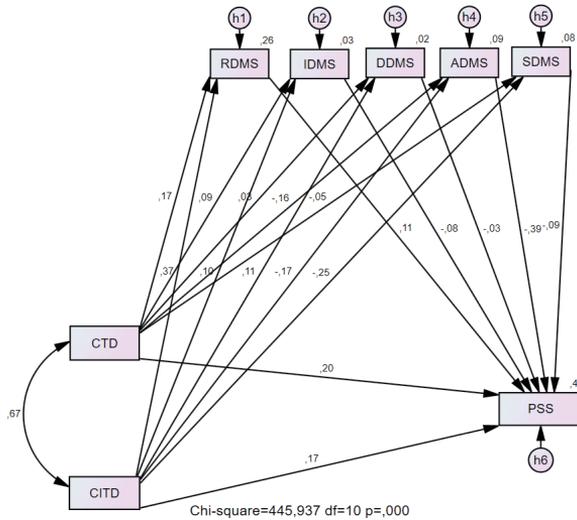
In this study the scales were implemented during the spring semester of the 2015-16 academic years. First, the researcher who administered the scales obtained the necessary permissions. Then, the scales were applied during visits to the districts and schools that made up the research sample. The school administrators were informed about the purpose of the research, volunteer researchers participated in administering the scales and the scale application duration lasted an average of 40 minutes.

Analysis of Data

In the scope of this research, a theoretical model was proposed to determine the relationship patterns among independent, mediator and dependent variables, and the proposed model was tested using the Structural Equation Model (SEM). A "Path Analysis with Observed Variables (Structural Equation Model)" was applied for testing the model. In Path Analysis with Observed Variables, the items of the variables are summed to obtain the total score and then added to the model. For this reason, the amount of error is included in the total score obtained (Şimşek, 2007).

The Structural Equation Model is a modelling tool and not a type of descriptive analysis. The proposed model is tested with the collected data (Barret, 2007). For this reason, the SEM offers great potential and opportunity for theory development in the behavioural and social sciences (Anderson & Gerbing, 1988). Furthermore, in this study the maximum likelihood (ML) method was used to estimate the model parameters in order to test the proposed model (Bayram, 2013; Çelik & Yılmaz, 2013).

In Figure 2, the proposed model of the relationship between the creative and critical thinking dispositions of school administrators is presented. This proposed model includes the decision making styles (rational, intuitive, avoidant, spontaneous, and dependent), problem-solving skills, and regression coefficients all presented with one-way arrows as well as the correlations presented using two-way arrows. The circles h1, h2, h3, h4, h5 and h6 represent the error values that were not directly observable in the dependent and mediator variables. Error values, refers to the errors that originated from the measurement and were unable to explain (DeVellis, 2014), and the affecting variables. The existence of error values was included in the analyses as part of the structural equation model (Şimşek, 2007) and represented the variance that a plotter does not explain (Sümer, 2000). In addition, the values on the upper right corner of the dependent and mediator variables represented the explained variance values (R^2). The regression, correlation, variance and error terms for the proposed model are provided in Figure 2.



CTD: Creative Thinking Dispositions, CITD: Critical Thinking Dispositions, RDMS: Rational Decision Making Style, IDMS: Intuitive Decision Making Style, DDMS: Dependent Decision Making Style, ADMS: Avoidant Decision Making Style, SDMS: Spontaneous Decision Making Style, PSS: Problem Solving Skills.

Figure 2. The proposed model.

Figure 2 shows that the Chi-square (χ^2) value was 445.937, the degree of freedom (df) was .10 and $p < .000$. The first condition for testing and accepting the proposed model is that the chi-square (χ^2) value is expected not to be significant ($p > .05$). As a second condition, the ratio (χ^2/df) obtained by dividing the chi-square value (χ^2) by the degree of freedom (df) must be less than 3 for a good fit and 5 or less for an acceptable fit (Çokluk et al., 2012 ; Kline, 2011; Meydan & Şeşen, 2011). If the chi-square or χ^2/df ratio is acceptable when the model is evaluated, the other fit values are checked. The proposed model was evaluated according to the fit indices. The most recommended fit indices by researchers (Jöreskog, 2004; Schumacker & Lomax, 2010) and reference intervals are provided in Table 2.

Table 2
Model Evaluation Compliance Indexes and Criteria

Indices	Perfect Compliance	Acceptable Compliance
χ^2/df oranı	$0 \leq \chi^2/df < 2-3$	$3 < \chi^2/df \leq 5$
GFI	$.95 \leq GFI \leq 1.0$	$.90 \leq GFI < .95$
AGFI	$.90 \leq AGFI \leq 1.0$	$.85 \leq AGFI < .90$
CFI	$.95 \leq CFI \leq 1.0$	$.90 \leq CFI < .95$
RMSEA	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$
RMR	$0 \leq RMR \leq .05$	$.05 < RMR \leq .08$
SRMR	$0 \leq SRMR \leq .05$	$.05 < SRMR \leq .08$

Reference: Prepared based on Barret (2007), Bentler and Bonett (1980), Byrne, Shavelson and Muthen (1989), Hu and Bentler (1999), Kline (2011), Maydeu-Olivares and Garcı’a-Forero (2010), Schermelleh-Engel et al. (2003), Schumacker and Lomax (2010), Tabachnick and Fidell (2007).

The proposed model was evaluated according to the indices given in Table 2, and since these indices were not at the acceptable level ($p < .05$; $\chi^2/sd=44.59$; RMSEA=.273; GFI=.837; AGFI=.412; CFI=.696; RMR=3.638; SRMR=.143), modifications were made based on statistical and theoretical reasons. The Structural Equation Model has a confirmatory feature and for this reason, when the Chi-square value and the ratio of Chi-square's degrees of freedom (χ^2/df) are not acceptable, then the researcher can modify certain parameters by adjusting them to certain values with the condition that sufficient reasons are indicated (Şimşek, 2007). The reason indicated for the making modification to the proposed model in this research was made within the framework of relevant research literature as well as in a rational and prudent way. However, one should be careful when changing the modification indices because corrections should not be made without first considering the theoretical justification; otherwise, a flawed model may be produced due to an improvement in the chi square value (Arbuckle, 2010). Modification indices define new relationships for the model as well as provide contributions to the model. Corrections having the highest contribution to the model are made in order. For example, each correction is based on a theoretical basis, interpreted, and the corrections to be made are decided upon. In this way, the model is re-defined and re-analysed (Şimşek, 2007). The modification indices show the change of parameters and the ways the model develops. Finally, the critical rate values are examined and corrected (Arbuckle, 2010).

To continue, the Chi-Square and compliance indexes, regression, variance and correlation coefficients should be significant to at least the .05 level, and the parameters that are not statistically significant should be removed from the model (Byrne, 2010; Şimşek, 2007). Based on these reasons, the regression arrows were removed between the school administrators' creative thinking dispositions and intuitive, spontaneous, dependent decision-making; between critical thinking dispositions and intuitive, spontaneous, dependent decision-making; as well as between intuitive, dependent decision-making and problem solving skills. In the first step of the modification, the statistically insignificant relations were extracted one-by-one and the analyses started with the highest value. The analyses were repeated after each subtracted relationship and the other relations were checked.

In the second step of the modification, co-variance was added to the error terms of the decision-making styles. Co-variance is a non-standardized measure of the relationship between variables and provides information on the direction of the relationship between the two variables (Bayram, 2013). The association of the errors of two variables means that they are related to each other (Şimşek, 2007). This theoretical rationale can be summarized as follows; Decision-making styles are the ways the individuals' react in decision-making situations, or the interpretation of the situation (Vroom, 1973). Since they are learned habits, decision-making styles can vary according to different

conditions, and different styles can also be applied to different situations (Brousseau & Driver, 2005). In specific decision-making situations, individuals can have more than one decision-making style as well as a variety of decision-making styles can be used in conjunction with a basic decision-making style (Driver, Brousseau, & Hunsaker, 1990). In addition, when the relevant research literature was examined, there were many studies that determined that decision-making styles were in effect related to each other (Scott & Bruce, 1995; Taşdelen, 2002: 49; Morera et al., 2006; Tekin & Ehtiyar, 2009; Dilmaç & Bozgeyikli, 2009). In the light of this information, co-variance was added between avoidant and spontaneous decision-making, and then the analyses were renewed. Finally, the SPSS package program was used in the analyses of the correlation between the variables, and the AMOS package program was used in testing the structural equation modelling (SEM).

Findings

Correlation Analysis Findings

Prior to the analysis of the structural equality model, a correlation analysis was conducted to determine the relationship pattern of school administrators' creative and critical thinking dispositions with decision-making style and problem solving skills. Table 3 shows the correlation matrix of the relationships between the total scores of the variables.

Table 3
Correlation Matrix between School Administrators' Creative and Critical Thinking Dispositions with Decision Making Style and Problem Solving Skills

		CTD	CITD	RDMS	IDMS	DDMS	ADMS	CTD
CITD	r	.670**	1					
RDMS	r	.424**	.489**	1				
IDMS	r	.156**	.161**	.300**	1			
DDMS	r	.125*	.146**	.298**	.351**	1		
ADMS	r	-.277**	-.280**	-.148**	.190**	.188**	1	
SDMS	r	-.211**	-.277**	-.176**	.223**	.087*	.609**	1
PSS	r	.457**	.459**	.309**	-.092*	.058	-.568**	-.444**

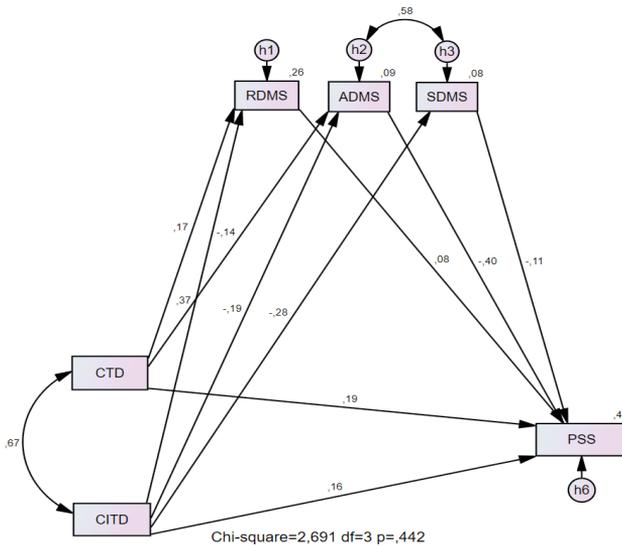
* $p < .05$; ** $p < .01$; $n=586$ *** CTD: Creative Thinking Dispositions, CITD: Critical Thinking Dispositions, PSS: Problem Solving Skills, RDMS: Rational Decision Making Style, IDMS: Intuitive Decision Making Style, DDMS: Dependent Decision Making Style, ADMS: Avoidant Decision Making Style, SDMS: Spontaneous Decision Making Style.

When the analyses in Table 3 was examined, there was a positive and significant relationship between creative thinking dispositions, and critical thinking dispositions ($r=.67$), rational ($r=.42$), intuitive ($r=.15$) and dependent ($r=.12$) decision-making styles and problem solving skills ($r=.45$). There was a negative and significant relationship between creative thinking dispositions, and avoidant ($r=-.27$) and spontaneous ($r=-.21$) decision-making styles. There was also a positive and significant relationship between critical thinking dispositions, and rational ($r=.48$), intuitive ($r=.16$) and

dependent ($r=.14$) decision-making styles and problem solving skills ($r=.45$) while there was a negative and significant relationship between critical thinking dispositions, and avoidant ($r=.28$) and spontaneous ($r=-.27$) decision-making styles. In addition, there was a positive and significant relationship between problem solving skills and rational decision-making style ($r=.30$) and a negative and significant relationship between problem solving skills and intuitive ($r=-.09$), avoidant ($r=-.56$) and instant ($r=-.44$) decision-making styles. Also importantly, there was no relationship between problem solving skills and dependent decision-making style.

Findings on the Current Model

The proposed model based on theoretical considerations and examples of prior research was tested with the collected data. Since the fit indices were not within the desired reference intervals, they were modified. The current model that emerged after the modification is provided in Figure 3.



CTD: Creative Thinking Dispositions, CITD: Critical Thinking Dispositions, RDMS: Rational Decision Making Style, ADMS: Avoidant Decision Making Style, SDMS: Spontaneous Decision Making Style, PSS: Problem Solving Skills.

Figure 3. Current model.

The Chi-square value of the current model ($\chi^2=2.691$; $p > .442$), the ratio of the Chi-square value to the degree of freedom ($\chi^2/df=2.691/3=0.897$), and the fit indices (RMSEA=.00; GFI=.99; AGFI=.98; CFI=1.0; RMR=.01; SRMR=.01) revealed that the model was fit and as a result the model was accepted. According to Şimşek (2007), it is necessary that the regression and correlation coefficients in addition to

the chi-square and fit indices be significant to at least the .05 level in order to accept a proposed model. In this research, along with the model's fit indices and chi-square value, the significance of the regression and correlation coefficients also supported the model fit ($p < .05$).

In the following, Figure 3 shows the correlation, regression, variance, and error values of the current model. In the model there was a moderate, positive and significant relationship between the school administrators' critical thinking dispositions and creative thinking dispositions ($r=.67$; $p < .05$).

All regression coefficients of the current model are statistically significant. The school administrators' creative thinking dispositions significantly predicted the rational decision-making style ($R^2=.17$; $p < .000$), avoidant decision-making style ($R^2=-.14$; $p < .01$) and problem solving skills ($R^2=.19$; $p < .000$). The school administrators' critical thinking dispositions significantly predicted the rational decision-making style ($R^2=.37$; $p < .000$), avoidant decision-making style ($R^2=-.19$; $p < .000$), spontaneous decision-making style ($R^2=-.28$; $p < .000$) and problem solving skills ($R^2=.16$; $p < .000$). In addition, the school administrators' rational decision-making style significantly predicted problem-solving skills ($R^2=.08$; $p < .05$); their avoidant decision-making style significantly predicted problem solving skills ($R^2=-.40$; $p < .000$); and their spontaneous decision-making style significantly predicted problem solving skills ($R^2=-.11$; $p < .01$).

The variance values of the current model were examined to in order to determine the rate of change of the variables. The variance values of dependent and mediator variables were significant ($p < .000$). In addition to the significance of the variance values, it was also important that the independent variable explained what percentage of change there was in the dependent variable. As presented in Figure 3, the current model indicated that school administrators' critical and creative thinking dispositions explained 26% of the change in rational the decision-making style. School administrators' critical and creative thinking dispositions explained for 9% of the change in avoidant the decision-making style. Their critical thinking dispositions explained 8% of the change in the spontaneous decision-making style. Their critical and creative thinking dispositions explained 45% of the change in problem solving skills, along with rational, intuitive, avoidant and spontaneous decision-making styles. In other words, 45% of the school change in problem-solving skills of school administrators was determined by their critical and creative thinking dispositions, together with rational, avoidant and spontaneous decision-making styles. As a result, it can be said that the model explained and predicted the relationship between creative and critical thinking dispositions, and the decision-making styles and problem-solving skills were proved to be valid.

Discussion

Nowadays, the educational demands on individuals and society are continuously increasing and diversifying. For this reason, the future role of school administrators is expected to vary and they will need to have a wealth of knowledge and skills in many fields that will allow them to assist in the development and improvement of the quality of schools and the education system as a whole (Açıklan & Özkan, 2015; Balcı, 2013; Çelik, 2002; Davis et al., 2005; Hansson & Andersen, 2007; Hill, 1992; Uçkun, 2002). However, while school administrators are attempting to meet these future expectations, they continue to face factors that can negatively affect the functioning of their schools; for example, issues with school discipline, materials availability and quality, as well as, the physical facilities, parent-student relations, environmental conditions, and bureaucracy (Çetin, Doğan, & Tatık, 2016; Semerci & Çelik, 2002). As a result, school administrators need for creative and critical thinking dispositions to effectively and successfully cope with the decision-making and problem situations that may negatively affect the functioning of their schools is paramount. When school administrators face negative, limiting or inhibiting factors in the decision-making and problem-solving processes; they can discover that new and different ideas, options, projects, works, products and/or solutions by using their creative thinking dispositions; they can also evaluate these choices with their critical thinking dispositions as well as positively influence the quality of the results. For example, in a study conducted by Tok (2008), relating critical and creative thinking skills to each other caused an applied education program to produce effective results. In this context, a theoretical model was proposed in this study which could identify the explanatory and predictive relationships between the school administrators' creative and critical thinking dispositions and decision-making styles (e.g., rational, intuitive, avoidant, spontaneous, dependent) and problem solving skills. The proposed model was tested using the collected data with the fit indices, regression and variance values of the model investigated and modified based on theoretical and statistical justifications and finally the model was retested. As a result of the analyses, the existence of explanatory and predictive relations between the mentioned variables was proved and verified. As a result, according to the current model:

- (i) School administrators' creative and critical thinking dispositions have a direct influence on their decision-making styles (rational, spontaneous and avoidant) and problem-solving skills;
- (ii) School administrators' rational, avoidant and spontaneous decision-making styles have a direct influence on their problem-solving skills,
- (iii) School administrators' creative and critical thinking dispositions have an indirect influence on their problem-solving skills through rational, avoidant and spontaneous decision-making styles.

The results obtained from this study were similar to the research results reviewed in the relevant research literature. For instance, [Barile \(2003\)](#) found that school principals' critical thinking dispositions were effective in problem solving, decision making and leadership activities, and the pre-service and in-service training/programs prepared based on the critical thinking disposition-based model supported the decision-making and problem-solving behaviours of the school administrators. [Wechsler et al. \(2018\)](#) have found that the creative and critical thinking skills of undergraduates from Spanish and Brazilian cultures were inter-related and that they needed these skills to improve their decision-making and problem-solving skills. [Pereira \(2014\)](#) found that high school art students used critical and creative thinking skills while making choices, setting goals, judging their progress, generating ideas, solving artistic problems and making decisions. It was recognized that individuals' critical thinking skills and dispositions can develop their decision-making activities ([Barile, 2003](#); [Hill, 1999](#); [Kökdemir, 2003b](#)), problem-solving skills ([MacPherson, 1997](#)) and rational decision-making styles ([Kashaninia, Yusliani, Hosseini, & Soltani, 2015](#)). Individuals with creative thinking skills and dispositions tend to generate more ideas which allows them to better solve administrative problems in general and usually in a more detailed manner ([Myszkowski, Storme, Davila, & Lubart, 2015](#)), to make decisions more rationally ([Deininger, Loudon, & Norman, 2012](#)) as well as to influence individuals' decision-making strategies ([Mumford et al., 2010](#)). In the problem-solving process, individuals make decisions more rationally while also determining their solution choices, focusing, searching and learning ([Isaksen & Geuens, 2007](#)), as well as strengthening their problem solving skills ([Čančer, & Mulej, 2013](#)) and most frequently they prefer the rational decision-making style ([Arn, 2007](#); [Mau, 2000](#); [Yıldız, 2012](#)). Ultimately, individuals' rational decision-making styles predict their problem-solving skills ([Morera et al., 2006](#)).

According to [Duff \(2003\)](#), mental models influence and shape educators' perception, understanding and interpretation of the world. No regulations and/or strategies can contribute to change and development unless there is also a significant change in the minds of individuals ([Senge, 2014](#)). The development and effectiveness of schools' largely depends on school administrators ([Schlechty, 2014](#)). As a result, school administrators' mental models ultimately determine the thinking activities, behaviours and roles which influence the academic, social and moral climate of their schools ([Barile, 2003](#)). In this way, creative and critical thinking dispositions can provide individual and managerial power to school administrators, and as a result, contribute to the administrators' mental models that may ultimately help determine their success in the school setting as well as reduce their overall resistance to change.

The quality of individuals' decisions and problem-solving skills influences their quality of life ([Paul & Elder, 2013](#)). Also, individuals' thinking skills and dispositions

may determine the happiness and success they experience in their personal and professional lives (De Bono, 2007). In addition, school administrators' creative and critical thinking dispositions can play a large role in positively influencing their professional and personal life by increasing their success rate in decision making and problem solving. This results because thinking dispositions increase the overall thinking performance of the individual (Tishman & Andrade, 1996; Tishman, Jay, & Perkins, 1993). As a result, school administrators' creative and critical thinking dispositions should be regarded as an invaluable cognitive resource that enables for the effective use of decision-making styles and problem-solving skills.

Considering the results obtained from this research, the development of the creative and critical thinking dispositions of school administrators and administrator candidates, together with their decision-making styles and problem solving skills should be fostered through participation in in-service training programs and/or through participation in post-graduate training. If this training occurs, school administrators may then view complex problems and/or decision making situations not as an obstacle but instead as an opportunity to develop themselves in a personal and professional sense as well as realize that these situations can be experienced in any field, and as a result, accept these situations as a necessity of life. Finally, in order to further advance and validate research in this area, a variety of dependent, mediator and independent variables (e.g., reflective thinking, communication skills, thinking styles, personality types, leadership styles, and so forth) can be added to the proposed structural equation model as well as the current model can be enriched and re-tested by taking samples from different professions, careers, age groups, school-types or school-levels.

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