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A Model of Decision-Making Based on Critical Thinking *

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Abstract

The aim of this study is to examine the causal relationships between high school students' inquisitiveness, open-mindedness, causal thinking, and rational and intuitive decision-making dispositions through an assumed model based on research data. This study was designed in correlational model. Confirmatory factor analysis and path analysis, which are structural equation modelling applications, were used to explain these relationships. The participants were 404 students studying in five high schools in Usak province. Critical Thinking Dispositions Scale developed by Yücel and Uluçınar (2013) was used to identify the high school students' inquisitiveness, open-mindedness and causal thinking dispositions. As for identifying rational and intuitive decision-making dispositions, an adaptation of the decision-making inventories by Scott and Bruce (1995) and Bachard (2001) was employed. The findings of the study show that inquisitiveness and open-mindedness dispositions directly affected casual thinking. In addition, causal thinking was found to have an effect on rational decision- making and intuitive decision making dispositions.

Keywords

Critical thinking
Causal thinking
Decision-making
Inquisitiveness
Dispositions
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Introduction

The concept of critical thinking has existed in the Socratic dialogue, Aristotle's Logic, Cartesian method and Kantian critique, but gained a different dimension in the contemporary tradition of thought with Dewey's (1933) reflective thinking (Uluçınar, 2012). Since Dewey, critical thinking has been examined by many theorists, and what it exactly is has been discussed from different perspectives. In this regard, an understanding of how individuals think critically was suggested (Budmen, 1967; Allen & Rott, 1969; Siegel, 1980; Ennis, 1996; Facione, 1990; Lipman, 2003). Within this understanding, it was asserted that individuals who think critically should have skills such as looking for facts, questioning, reflecting, analysing the causes and effects of events, integrating and evaluating (Bloom, 1956; Facione, Sánchez-Giancarlo, Facione, & Gainen, 1995). Therefore, critical thinking is seen as a target skill and disposition to be developed in students in all educational programs (Bailin, 2002; Smith, 2003). Shahrokh (1998) sees critical thinking as a priority skill compared to creative thinking, decision-making and problem solving. In the cases where there is no creative thinking, decision-making and problem solving, samples of critical thinking can be found. Although

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not in every circumstance, creative thinking includes critical thinking. Similarly, critical thinking has a role in the decision-making skill.

Studies on the development of critical thinking in students mostly focus on instructional techniques and activities that are learning-teaching strategies used in the classroom such as effective learning (Kim, Sharma, Land, & Furlong, 2013), cooperative learning (Gokhale, 2012), discussion (Hoaglund, 1993; Lu, Ho, Hau, & Lai, 2014) project-based teaching method (Ten Dam & Volman, 2004), case study (Elksnin, 2005), poetry art (Rich, 1993), and composition writing (Shen, 1993). However, since critical thinking is a more professional, advanced, high-quality and effective thinking skill (Schafersman, 1991), its development is considerably slow and does not occur immediately (Wolcott, Baril, Cunningham, Fordham, & Pierre, 2002). For this reason, in developing critical thinking, dispositions that trigger critical thinking rather than in-class teaching should be addressed on a psychological, social and cultural basis (Mathews & Lowe, 2011).

Critical thinking is a primary skill among high-order thinking skills. For this reason, students should be thought to evaluate, make decisions and, before making a judgement, think critically (McCarthy, 1992). Another objective of educational programs is to guide students to make sound decisions after going through critical thinking (Ministry of National Education, 2013). Therefore, this study aims to explain the role of critical thinking in decision-making, and the role of inquisitiveness and open-mindedness as dispositions affecting critical thinking. It tests the relationship between these variables from a rational perspective and reveals the existing relationship based on research data. The model suggested in this study is based on a linear relationship between open-mindedness, inquisitiveness, causal thinking and decision-making. This model emphasizes that as affective dispositions or characteristics, inquisitiveness and open-mindedness should be prioritized in the step of forming the goals of an instructional program. It then proposes to develop critical thinking (Shahrokh, 1998), another high-order skill, and similarly, decision-making skills. Consequently, it is suggested to follow the logic of this model in taxonomically structuring instructional goals, especially unit outcomes.

Inquisitiveness

Inquisitiveness is a complex disposition of mind that is related to various functions (Perlovsky, Bonniot-Cabanac, & Cabanac, 2010). It is conceptualized as a positive emotional-motivational system associated with the recognition, pursuit, and self-regulation of novelty and challenge (Kashdan, Rose, & Fincham, 2004). Inquisitiveness represents interest, seeking novelty, being open to experience, and individual's intuitive desire for experience and information (Kashdan, 2004). According to Loewenstein (1994), inquisitiveness is (1) the desire to reach information intuitively, (2) a passion formed with intense motivation, and (3) the desire to learn. Berlyne (1957) stated that individuals' inquisitiveness can be unveiled with external stimuli such as complexity, novelty, uncertainty and contradiction. Inquisitiveness is a powerful tool that directs individuals' actions and motivates their behaviours while doing research in a context to solve uncertainties and reveal the unknown. From this perspective, it is regarded as a basic instinct or an inborn mechanism that enables individuals to learn events or phenomena around them by using various tools and technological developments (Arnone, Small, Chauncey, & McKenna, 2011).

Different theories have been proposed to explain what inquisitiveness is and how it arises. In the first theory, Berylne (1966) argues that inquisitiveness is a humane urge, like hunger or thirst, that triggers learning information. According to the second theory, inquisitiveness represents the inconsistency in individuals' perspective related to an event or phenomenon in a more cognitive sense. In the third theory, inquisitiveness is defined as individuals' desire to fill the gap between their existing knowledge and the desired level of knowledge (Loewenstein, 1994). To stimulate students' inquisitiveness disposition, they need to be aware of the gaps in their own knowledge (Borowske, 2005). As a disposition that trigger students' desire to learn (Topliff, 2013), inquisitiveness is an effective variable in predicting student achievement (Arnone, Grabowski, & Rynd, 1994; Von Stumm, Hell, & Chamorro-Premuzic, 2011). On the other hand, based on empirical findings, inquisitiveness

disposition being related to characteristics such as emotional intelligence (Leonard & Harvey, 2007), personality traits (Zuckerman & Litle, 1986; Reio & Callahan, 2004), self-efficacy (Çağırgan-Gülten, Yaman, Deringöl, & Özsarı, 2011), and success and goal orientation (Eren, 2009) show that inquisitiveness disposition has positive effects on cognitive performance (Alberti & Witryol, 1994). Therefore, inquisitiveness is one of the prominent characteristics that enable individuals to think over a subject.

Open-Mindedness

Open-mindedness, which is described as an educational ideal (Siegel, 2009), is a cognitive characteristic that refers to individuals' willingness to consider related findings and claims while thinking over their own beliefs and values. However, this characteristic should be the justification for individuals' accepting these findings and claims to reach right and defensible results (Hare, 2004). Being individuals' willingness to consider experiences, beliefs, values and perspectives different from their own, open-mindedness allows them to investigate how they think and act. Open-mindedness enables them to re-consider their assumptions, notice their misconceptions, and think of alternative ways of decision-making. It is important in teaching how environmental factors (economical, historical, religious, geographical, political and technological) structure thinking and life styles in people's lives (Merryfield, 2012). From this perspective, open-mindedness is an important characteristic that develops the thinking ability independent from one's beliefs (Rodriguez, 2011). In Olsen's (2005, 2006), Jenks (2011) and Adler's (2005) studies, open-mindedness is featured with issues such as pluralism, poverty, corruption, differences and multiculturalism. In addition, as an approach in moral education (Hare, 1987), open-mindedness is closely related to empathy as an ability to understand other people's thoughts (Cosme, Pepino, & Brown, 2010).

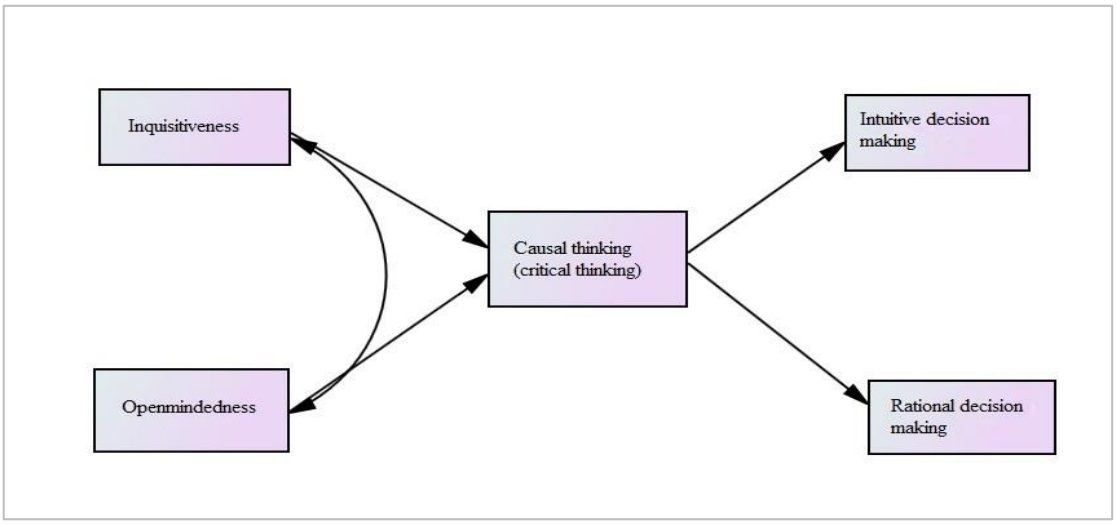
Decision-Making Styles

Exploratory studies on decision-making draw attention to various decision-making styles. Scott and Bruce (1995) structured decision-making styles in five categories that are (1) rational, (2) intuitive, (3) dependent, (4) avoidant and (5) spontaneous. (1) *Rational decision-making.* Individuals who have this decision-making style makes decisions mostly based on rational reasons and evaluation among other alternatives. (2) *Intuitive decision-making*. Those who make decisions based on intuition act with foresight, senses and feelings and without conscious thinking. (3) *Dependent decision-making.* This style refers to individuals' making decisions based on others' advice and guidance. (4) *Avoidant decision-making.* Individuals who have this style perform avoidance behaviours in reaching a decision, and avoid making decisions mostly because of lack of confidence. (5) *Spontaneous decision-making.* Individuals who have the spontaneous decision-making style make their decisions randomly and as quick as possible. In a study, Conteh (2009) tested the effectiveness of analytical-autocratic, heuristic-autocratic, analytical-consultative and heuristic-consultative decision-making styles on the decision-making process. According to this study, consultative decision-making style had the highest influence on the decision-making process and products.

Studies on decision-making styles seem to focus on validity, reliability and construct of scales (Reyna, Ortiz, & Revilla, 2014; Tuinstra, van Sonderen, Groothoff, van den Heuvel, & Post, 2000), adolescent risk taking behaviour (Barber, 2005; Çolakkadıoğlu & Güçray, 2012), and the decisio-making styles of employees in various organisations (Khasawneh, Alomari & Abu-tineh, 2011).

The Relationships Between Inquisitiveness, Open-Mindedness, Causal Thinking, Rational and Intuitive Decision Making Styles

The basis of Dewey's (1933) perspective on critical thinking is children's being aware of the causes and results of the events they encounter, and freeing themselves intellectually and cognitively under certain conditions. Similarly, Siegel (1980) defined critical thinking as the disposition of acting based on causes and justifications. From this point of view, critical thinking was taken as a variable in this study as causal thinking. As a skill, critical thinking is seen as a cognitive and analytical thinking activity while individuals need to have dispositions such as open-mindedness, inquisitiveness, honestness, common sense and objectiveness in order for critical thinking to occur (Ennis, 1996; Facione, Facione, & Shanchez, 1994; Irani, Rudd, Gallo, Ricketts, & Friedel, 2007; Chen, Cheng, Liu, & Tsai, 2011). In this study, it is emphasized that to be able to think about an event or situation based on reasons, individuals need to be open-minded and inquisitive about that topic. Accordingly, individuals are thought to make more sensible and effective decisions when they intellectualise the analyses, syntheses and evaluation in the thinking process, or in other words go though a thinking process based on reasons (Helsdingen, Bosch, Gog, & Merriënboer, 2010; Gunn, Grigg, & Pomahac, 2006). In this regard, the aim of the study was to confirm a model assuming causal relationships between high school students' inquisitiveness, open-mindedness, critical thinking (causal thinking) and decision-making (rational and intuitive) dispositions based on research data. The graph related to the assumed model based on theoretical background is presented below.



Graph 1. The Assumed Model Related to Open-Mindedness, Inquisitiveness, Causal Thinking, Intuitive and Rational Decision-Making Dispositions

According to the model formed based on this primary aim, the following hypotheses were tested:

H1: Inquisitiveness disposition significantly predicts causal thinking.

H2: Open-mindedness significantly predicts causal thinking.

H3: Causal thinking significantly predicts rational decision-making style.

H4: Causal thinking significantly predicts intuitive decision-making style.

H5: The causal thinking variable has a full mediating effect between the independent (inquisitiveness and open-mindedness) and dependent (rational and intuitive decision-making) variables.

Method

Research Model

Aiming to confirm an assumed model of causal relationships between high school students' inquisitiveness, open-mindedness, critical thinking (causal thinking) and decision-making (rational and intuitive) dispositions based on research data, this study was designed in relational model. Studies designed in relational model are conducted to identify the relationships between two or more variables, and obtain clues of cause and effect (Christensen, Burke, & Johnson, 2015). The independent variables focused in this study were inquisitiveness and open-mindedness while the dependent variables were intuitive and rational decision-making.

Population-Sample

The population of the study consisted of students studying in high schools in Usak province in 2012-2013 school year. The sample comprised of 404 students selected from schools with low-medium-high socioeconomic levels through stratified sampling since the variables focused in the study differed in terms of socioeconomic levels (Kayagil & Erdoğan, 2011). The schools in sampling is classified into categories in terms of critera such as absent of either mother or father/ separated from parent, pscyho-social situations, the use of harmful drug, financial situation, parental education set out by a study[1] of Provincial Directorate of National Education. The schools were chosen ramdomly from categories. The demographic information related to the sample is presented in Table 1.

Table 1. Frequency and Percentage Distribution for the Demographic Information of the Sample

		N	%
Gender	Female	234	57,9
	Male	170	42,1
Major	No field[2]	141	34,9
	Social	25	6,2
	Equally-weighted	163	40,3
	Science	75	18,6
Grade	9th	141	34,9
	10th	103	25,5
	11th	110	27,2
	12th	50	12,4
Total		404	100

As is seen in Table 1, a total of 404 high school students, 234 of whom (57,9%) were female and 170 (42,1%) were male, were included in the sample. 141 of the students in the sample (34,9%) did not have a field of study, 25 students (6,2%) were in the social field, 163 (40,3%) in the equally-weighted field and 75 (18,6%) in the science field. 141 of the students were 9th graders (34,9%), 103 were 10th graders (25,5%), 110 were 11th graders (27,2%) and 50 were 12th graders (12,4%).

Data Gathering Tools

In this section, the information regarding the sub-scales of inquisitiveness, open-mindedness, causal thinking, rational and intuitive decision-making dispositions are presented.

[1] This information was obtained from the study which was conducted by Counselling and Research Center and supported by Provincial Directorate of National Education

[2] 9th grade: Since students in this grade had not chosen their field of study yet, they were described as not having a field.

Inquisitiveness disposition sub-scale. This sub-scale is a sub-dimension of critical thinking dispositions scale developed, validity and reliability was confirmed by Yücel and Uluçınar (2013). The Inquisitiveness dimension consisted of four items including "I try to follow the novelties that sciences brings.", "I try to follow interesting events around the world.", "I enjoy being engaged in many different activities." and "I try to follow new movies, music and books." The internal consistency coefficient of this dimension containing four items was .62.

Open-mindedness sub-scale. This sub-scale was also a sub-scale of Yücel and Uluçınar's (2013) critical thinking dispositions scale and comprised of four items. The items were "I show respect to others views even if they find my opinion non-sense.", "Even if the ideas of people whose views are opposite to mine, I listen to their speech till its end.", "Even if I know a lot about a topic, I prefer to consult to someone else." and "I get along well with my friends having a different world view." The open-mindedness dimension containing four items had a consistency coefficient of .59.

Causal thinking sub-scale. Being a sub-scale of Yücel and Uluçınar's (2013) critical thinking dispositions scale, the causal thinking dimension consisted of six items. The items in this dimension that had validity and reliability included "In many events, I try to learn how and why something happened.", "When someone tells me an event like it is true, I ask that person how he/she knows it.", and "I know why I should believe in the moral rules and values that I believe." The Cronbach alpha coefficient of this dimension was .62.

Decision-Making Styles Scale

To identify the students' decision-making dispositions, the items included in Scott and Bruce's (1995) and Bachard's (2001) decision-making style inventories were adapted into Turkish by researchers Following the factor analysis conducted after the implementation, the scale was divided into the sub-scales of rational decision-making and intuitive decision making [KMO=.811; Barlett's test (χ2)=1016,947; sd=66; p=.000]. The explained variance rates of the dimensions were 26.20 and 21.53, respectively. Information related to these sub-scales is provided below.

Rational decision-making. This dimension includes items related to rational decision-making such as "I think I make decisions more easily in a rational and systematic way." and "The best decisions I make are formed through a detailed examination based on facts." The reliability coefficient of this dimension containing five items was .75.

Intuitive decision-making. Including items such as "I set my goals based on inspiration rather than reason.", "When I feel that my decision is right, it does not matter for me if it is rational or not." and "I rely on my feelings and behaviours when I make a decision", this dimension focuses on individuals' disposition of making decisions according to their intuition and feelings. Consisting of 7 items, the reliability coefficient of the intuitive decision-making disposition dimension was .79.

Data Analysis

To see whether the assumed model was suitable to the data, path analyses were conducted in AMOS 21.0 by using maximum likelihood calculation. In this analysis, it was tried to determine relationships among the variables in the assumed model. Furthermore, the mediation effect of the causal thinking variable was examined as a both independent and dependent variable in the model. According to the assumed model, inquisitiveness and open-mindedness predicted causal thinking. As for causal thinking, it predicted rational and intuitive decision-making style variables. The suitability of the model was evaluated by using chi-square fit test ($\chi 2$), common goodness-of-fit indices (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), incremental fit index (IFI) and the root mean square error of approximation) (RMSEA) values (Kline, 2011; Schumacker & Lomax, 2010). Among these values related to the model, the chi-square value ($\chi 2$/sd=1.78; p=.000), which was used to test the general fit of the assumed model to the data and is an initial fit index, showed the sufficiency of the model (Bentler, 2006). Although the p value in the chi-square test should not be significant and the chi-square value should be lower than three in order for the model to be accepted, the chi-square value may be significant as a result of the test due to the degree of freedom being large that is an important criterion. However, instead of the p value being significant or not, the ratio of the square to the sd is used to evaluate the general fit of the model. In this regard, the $\chi 2$/sd ratio being lower than 3 is argued to show that the general fit of the model is acceptable even if the chi-square value is significant (Meydan & Şeşen, 2011). In addition, with fit index values such as GFI=. 913; AGFI=.895; IFI=.892; CFI=.890 being close to 1 and the value [RMSEA=.044] being .05 or lower, it is possible to claim that the model is acceptable (Arbuckle, 2008). To improve the fit index values of the model, modifications were made in the inquisitiveness, causal thinking, intuitive and rational decision-making variables.

Findings and Results

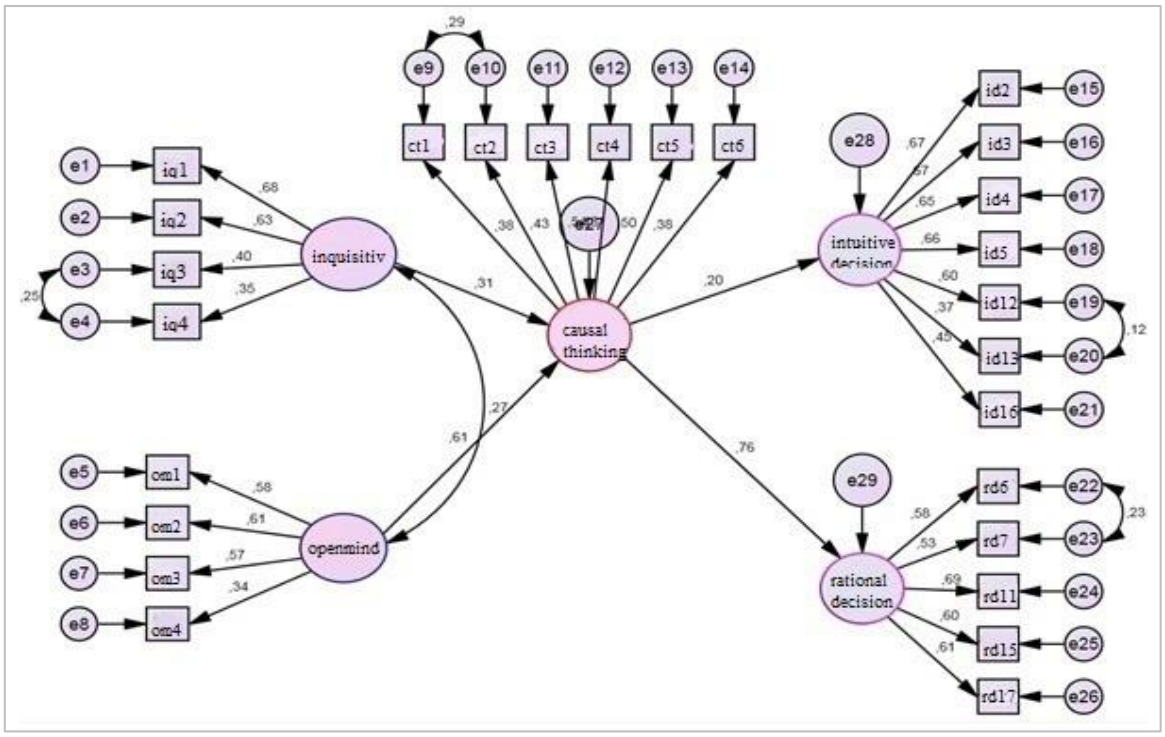
The descriptive statistics and correlational values related to the variables in the study are presented in Table 2. The correlational values showed that causal thinking had low-level significant relationships with inquisitiveness (r=.28) and intuitive decision-making (r=.42) dispositions while having moderate-level and positive relationships with open-mindedness (r=.42) and rational decision-making (r=51) dispositions. Besides, inquisitiveness disposition had low-level, significant and positive relationships with open-mindedness (r=.19), intuitive (r=.14) and rational decision-making (r=.27) dispositions. Moreover, the correlation coefficients between open-mindedness disposition and intuitive and rational decision-making dispositions were r_s=.20 and r_m=.37, respectively (p<.01). On the other hand, no significant relationship was found between intuitive decision-making and rational decision-making styles.

Table 2. Arithmetic Mean, Standard Deviation Values and Correlation Coefficients of Causal Thinking, Inquisitiveness, Open-Mindedness, Intuitive and Rational Decision-Making Dispositions

Variables	D	sd	(1)	(2)	(3)	(4)	(5)
(1) Causal thinking	4,01	,609	1				
(2) Inquisitiveness	3,73	,740	,281**	1			
(3) Open-mindedness	3,65	,754	,419**	,186**	1		
(4) Intuitive decision-making.	3,33	,743	,190**	,144**	,200**	1	
(5) Rational decision-making.	3,80	,719	,513**	,268**	,367**	,048	1

N=404, **p <.05

The path analysis graph to confirm the fit of the model formed based on theory, and the effect coefficients between the variables is presented in graph 2.



Graph 2. Path Model Between Inquisitiveness, Open-Mindedness, Causal Thinking, Intuitive snd Rational Decision-Making Styles

Table 3. Standardized Regression Coefficients and Significance Values of the Variables in the Path Analyses

Independent Variable	Dependent Variable	Std. regression coefficient	Standard Error	(p)	Explained Variance
Inquisitiveness	Causal thinking	.31	.093	.001	.576
Open-mindedness	Causal thinking	.61	.143	.000	
Causal thinking	Rational decision-making	.76	.259	.000	.575
Causal thinking	Intuitive decision-making	.21	.156	.004	.042

Table 3 states, inquisitiveness (β=.31) and open-mindedness (β=.61) dispositions significantly and positively predicted causal thinking (p<.05). According to this result, H1 and H2 hypotheses may be accepted. In addition, inquisitiveness and open-mindedness dispositions explained 58% of the variance in causal thinking. On the other hand, the standardized path coefficients of causal thinking on intuitive and rational decision-making styles were β_{ns}=.20 and β_{nm}=.76, respectively. While causal thinking represented 57.5% of the variance in rational decision-making style, it explained only 4.2% of the variance in intuitive decision-making style. Therefore, it is possible to accept H3 and H4 hypotheses.

As stated in the H5 hypothesis, the mediation effect of causal thinking between inquisitiveness and open-mindedness dispositions, and rational and intuitive decision-making styles was tested. According to Baron and Kenny (1986), there are three conditions for a variable to be a mediating variable. These are; (1) independent variable(s) (inquisitiveness and open-mindedness) affecting the mediating variable (causal thinking), (2) the mediating variable (causal thinking) having a significant effect on dependent or independent variables (rational and intuitive decision-making), and (3) independent variables (inquisitiveness and open-mindedness) having significant effects on dependent variables (rational and intuitive decision-making). However, since causal thinking did not have a significant effect on inquisitiveness and open-mindedness dispositions, and rational and intuitive decision-making styles, it had a "complete mediating effect". Therefore, based on theory, it is possible to claim that this hypothesis is acceptable. Mediation analysis is conducted to predict the role of causal mechanisms that convey the effects of an independent variable on a dependent variable (Hicks & Tingley, 2011).

To determine to what extent causal thinking is significant as a mediator variable, Sobel test is used (Preacher & Hayes, 2007). In the equation below, z value and p significance value is calculated through the Sobel test (Preacher & Hayes, 2007, 2008).

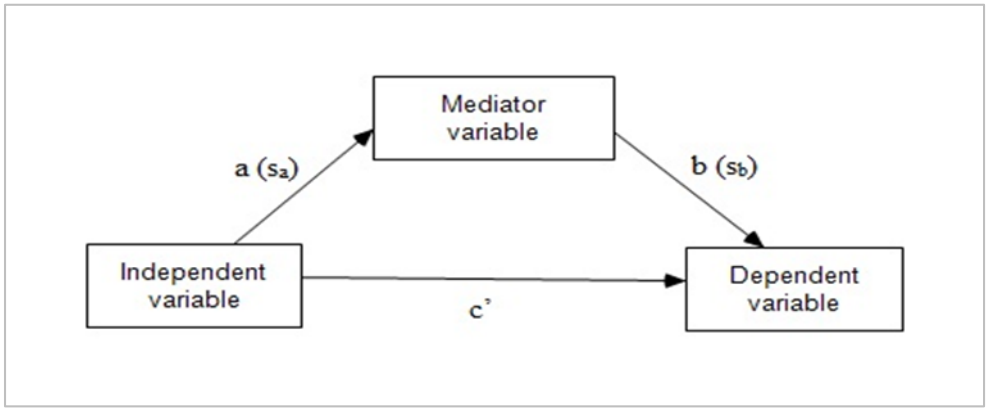
$$\text{Sobel test } z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$$

a= The non-standardized regression coefficient between the independent and mediator variables.

s_a= The standard error of the regression coefficient between the independent and mediator variables.

b= The non-standardized regression coefficient between the mediator variable and the dependent variable.

s_b= The standard error of the regression coefficient between the mediator variable and the dependent variable.



Graph 3. Mediator Variable Model

Four different tests were conducted to see whether the mediating effects of the causal thinking (mediator) variable were significant between the inquisitiveness and open-mindedness (independent variables) dispositions, and rational and intuitive decision-making (dependent variables) styles.

Table 4. Sobel Test Results for the Significance of the Mediating Effect of the Mediator Variable Between the Independent and Dependent Variables

Independent Variable	RC	SE	Mediator Variable	RC	SE	Dependent Variable	z value	p value (one way)
Inquisitiveness	.298	.093	Causal thinking	1.524	.259	Rational decision-making	2.81	.002
Inquisitiveness	.298	.093		.450	.156	Intuitive decision-making	2.14	.002
Open-mindedness	.583	.143		1.524	.259	Rational decision-making	3.35	.000
Open-mindedness	.583	.143		.450	.156	Intuitive decision-making	2.35	.018

RC: Regression coefficient; SE: Standard error

According to the Sobel test results, the z values and p values for the mediating effects of the causal thinking (mediator) variable between the inquisitiveness (independent) variable and rational and intuitive decision-making (dependent) variables are $z_{(ird)}$=2.81; p=.002, $z_{(iid)}$=2.14, respectively (p=.002). Furthermore, the z values related to the mediating effects between the open-mindedness (independent) variable and rational (z=3.35) and intuitive (z=2.35) decision-making variables (dependent), causal thinking was found to be significant as mediator variable (p<.05). These findings support the significance of the mediating effect of the causal thinking variable between the inquisitiveness and open-mindedness, and rational and intuitive decision-making variables in the model.

Discussion and Conclusion

In the study, the causal relationships between high school students' inquisitiveness, open-mindedness, causal thinking and rational and intuitive decision-making dispositions were confirmed through an assumed model based on research data. The model proposed based on theory shows a compatibility with fit values of the model obtained though structural equation modelling.

To test H1, H2, H3, and H4 hypothesis, path analysis points out that there are significant causal relationships among variables supposed model. As examined in H1 hypothesis, we found that inquisitiveness dispositions predicted causal (critical) thinking. This finding indicated that inquisitiveness has an important agent in development of critical thinking. The Delphi project carried out by Facione (1990) and supported by American Phiosohy Association investigated what critical thinking is, which skills and disppositions it consisted. The project in which 46 academicians participated in various academic disciplines revealed that individuals who are critically thinking has dispositions like inquisitiveness, open-mindedness, systematicity, cognitive maturity, and seeking truth. Similary, Sander (1992) sought perceptions of academic staffs about critical thinking in nursing faculty. Based on the results of principle components analysis that he performed on disposition scale, critical thinkers predicted to have dispositions of open-mindedness, intellectual curiosity, analticity, and conscious skepticisim. As Ennis (1996) stated that a disposition refers to a natural necessity for the actualisation of a skill or behaviour. He explains the concept of disposition with an analogy saying that "to break an egg, it needs to be suitable for being broken". In other words, in order to develop critical thinking skills such as inference, evaluation, induction, and deduction (Facione, 1990; Ennis, 1996), individuals need to have dispositions stated above. The studies supported H1 hypothesis tested and proved that inquisitiveness is a disposition explaining and predicting critical thinking. Inquisitiveness is an internal motivation tool that attracts out attention and directs us to question and research (Loewenstein, 1994). The more students inclined to be curious about a subject or issue, the more they have depth understanding of it. They are encouraged to improve their cognitive processes such as meaning, connecting between relationships, inference, analysis, synthesis, and evaluation (Bloom, 1956). As a result, inquisitiveness a component that motivated and aroused to inquire reasons

of phenomena and to think critically. H1 hypothesis is accepted and it is possible to argue that inquisitiveness is a feature associated with critical thinking. In study of Muis, Psaradellis, Lajoie, Leo, and Chevrier (2015) tested the relationships among epistemic beliefs, emotions, learning strategies, and learning outputs, they found that inquisitiveness is positively associated with critical thinking. Colucciello (1997) also found a relationship between inquisitiveness and critical thinking. As a result, the more students are involved in posing significant questions, searching, and inquiring activities about a phenomena or issue, the more their capacity to think critically will be increased. Zion & Sadeh (2007) found that curious students are inclined to participate in th community of inquiry and learning because the community presents dynamic process to improve natural curiostiy about the world that they have lived (Chiarotto, 2011). Furthermore, Barell (2003) put forward that inquisitiveness stimulate intellectual development and it enables to connect between new and known. Barell also noted that an individual will not be grown without to the desire to explore with senses of touching, taste, hearing the world. He/she needs to have the dispositions to discover the world and make it a meaningful place in which to live. In this way, he cited that brain grown is the result of interacting with enriched environments. These environments are characterized by novel challenges, opportunities for free choice and self-direction, situmulation of all the senses, pressure-free social interaction, and experiences of self-assessment (cited by Barell, 2003; Diamond & Hopsın, 1998). As Harty and Beal (1984) pointed out, situations such as "unexpected situation", "scepticism", "mind confusion", "contradiction", "surprised", "cognitive conflict", "novelty", "complexity", "discripancy", "ambiguity", "lack of clarity" and "change" will get students be more critically thinking and inquiry by stimulating their natural curiosity in classroom. Therefore, teachers should direct students' curiosity and encourage to think critically by posing questions like "why dinosours might be wiped out?, "what would be different if Turkey didn't have a coast to sea", "why don't ships sink though they have highly gigantic weight?". In order to improve their curiosity and critical thinking skills, they should be encouraged to participate in natural processes like trip-observation (Carroll, 2007), museums (Ciolfi & Bannon, 2002; Rounds, 2004), science, art, and culture centers (Falk, Needham, Dierking, & Prendersgast, 2014) to recognize the reasons with inquiry and quesitioning processes.

As H2 hypothesis is tested, open-mindedness disposition predicted significantly critical thinking. Jus as inquisitiveness disposition, The studies of scale development (Facione et al., 1994; Irani et al., 2007; Park & Kwon, 2007; Chen et al., 2011) and exploratory research (Ennis, 1996; Facione, 1990) revealed that open-mindedness was a prequisite disposition in the development of critical thinking skills. Stanovich and West (1997) stated that open-mindedness as unprejudicedly thinking disposition was an essential feature of critical thinking. As a matter of fact, we found that open-mindedness explained and predicted critical thinking much more than inquisitiveness. As discussed previously, inquisitiveness is internal motivation tool that direct us thinking about phenomena or idea while open-mindedness reflects the attitude toward a idea or phenomena. When an individual has negative attitude against extreme ideas to own understanding and reach unbiasedly to it, it is unpossible that he/she has full understanding of it. It is therefore possible to say that act of critical thinking performs effectivelly. Although we found that there was no significant relationship between open-mindedness and inqusitiveness, open-mindedness was an effective feature than inqusitiveness. Open-mindedness may be regarded as motor of thinking which means to behaving unprejudicedly and having respectfull attitude towards others' thoughts, values, and beliefs (Bailin, Case, Coombs, & Daniels, 1999; West, Meserve, & Stanovich, 2012). In conceptions of critical thinking, since it requires thinking objectively, an individual needs to display an positive attitude to evaluate critically different views and ideas. This situation enables them to be positive towards the accuracy of different ideas and views and their internal values (Hare, 1993), research and internalise information (Cegarra-Navarro & Cepeda-Carrión, 2008), insist on accessing information (Haran, Ritov, & Mellers, 2013), have the opportunity to question their opinion on an issue (Hare, 2011), and analyse and evaluate phenomena, ideas, claims, options and alternatives critically (Carroll, 2004). Emprical studies as well as theoretical discussions show that open-mindedness is an effective characteristic for critical thinking. For example, in Berkovich's (2014) study, he suggested that it is one of eight components in model of dialogical

pedagogy which is used in development of authentic leadership and suggested on thematic analysis on qualitative data. In model, he determined that it is a structure supporting critical thinking. In additon to Berkovich's study, Colucciello (1997) also found that there is a significant relationship between open-mindedness and critical thinking. Furthermore, in the study of Heijltjes, van Gog, Leppink, and Paas (2015), critical thinking instruction increased reasoning skills, they found that reasoning skills were associated with open-mindedness in both pre-test and post-test. That is, although an idea or view contradicts with own thoughts, beliefs, and values; if the individual tends to being open minded toward them, he/she go through a certain thinking process for claimed arguments, analyse and evaluate causes and justifications, and as a result, make correct guesses and choices (Haran et al., 2013), and finally make critical decisions (Dunham & Pierce, 1989; Rieke, Sillars, & Peterson, 2005). As discussed earlier, it is suggested that it is an important feature in the development of critical thinking. As result, students' open-mindedness dispositions need to be improved in classroom. Merryfield (2012) put forward four strategies for developing open-mindedness. These are: (1) providing cross-cultural interaction, (2) avoiding stereotyped thought, biased, and over-generalisation, (3) showing learning styles of different people, (4) developing habits of inquiry different ideas. Moreover, teachers should enable students to express themselves in classroom in order to improve their's open-mindedness in the development of critical thinking. Furthermore, in order to be critical thinkers, teachers need to listen what they say and encourage them to talk (Thayer-Bacon, 1992).

As H3 and H4 hypothesis are tested, critical thinking significantly predicted rational and intuitive decision making. The findings indicated that critical thinking predicted more rational decision making than intuitive decision making. Although there was no significant relationship between rational decision making and intuitive decision making, critical thinking predicted two decision making styles. The results also showed that individuals who think critically make great decision on logic and rationality. Critical thinking is a form of thinking which considers to act of reasons and excuse (Siegel, 1990; Ennis, 1996) using higher order thinking skills such as inference, induction, deduction, and evaluation (Facione et al., 1994). Like critical thinking, logical thinking means the act of inference and making logically consistent arguments (Knight, 2005). Also, critical thinkers pay attention to being consistent and logical claims (Koray & Köksal, 2009). On the other hand, as Lipman (2003) stated that critical thinking is a form of thinking which is self-correcting, and considers logical and consistent relationships. This inference motivates us to extend an argument such as logical thinking skills a part of critical thinking. Consequently, As H3 hypothesis is tested, it may be said that individual who think critically make great logical decisions. Experimental studies show that critical thinking instruction has an impact on decision making processes (Bosch & Helsdingen, 2002; Van Dongen, Schraagen, Eikelboom, & Te Brake, 2005; Schraagen & Van de Ven, 2008). In the prviously cited studies, it was found that the experimental group on critical thinking instuction had more effective decision making skills and processes than that of control group. Especially, Schraagen and Van de Ven (2008) developed a critical thinking tool which makes active students' reasoning skills in instruction. In this way, decision makers are aware of incompleteness (missing arguments for conclusions), conflict (both confirming and contradicting arguments for a conclusion) and unreliability, as well as coverage (degree to which available evidence is explained), ambiguity (evidence that can be explained in more than one way) and uninformative evidence (information that does not help to distinguish between conclusions). On the other hand, As H4 hypothesis is tested, critical thinking significantly predicted intuitive decision making. Rational decision making style is based on mind, logic, and reasons while intuitive decision making is concerned with emotions, feelings, and intutions. This finding shows that an individual may make a decision on intuitions in thinking critically. Accoding to Lipman's (2003) conception of critical thinking, it is a form of thinking that is sensitive to context. Thus, an individual may make decisions on intuitions in a given context except of reasons, claims, and rational frameworks. However, Gaudiano, Brown, and Miller (2011) found that there was significant, negative relationship between critical thinking and reliance on intuition in decision making. This finding showed that critical thinkers value intuition less in decision

making. Although this finding contradicts with the result found in this study, critical thinking has more predictive power on rational decision making. So, it is possible to argue that two studies supported same finding.

As a result, based on the discussions of findings, it is recommended that dispositions such as inquisitiveness and open-mindedness to be included among the prominent outcomes of educational programs kindergarden through high school level. Besides, which dispositions or cognitive/affective characteristics are effective in students' critical thinking from a psychological, social and cultural basis, and to what extent, should be studied. It is suggested that projects and various activities towards the development of these characteristics be conducted.

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