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Middle School Students' Epistemological Beliefs: Development of A Scale Based on Vignettes and Scenarios

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ABSTRACT

This study aims to develop a scale based on vignettes and scenarios to determine the epistemological beliefs of middle school students. The study group of this cross-sectional study is investigated by random sampling and consists of 257 middle school students studying in Manisa province in western Turkey in the 2019-2020 academic year. For construct validity, exploratory factor analysis and confirmatory factor analysis were performed respectively. The research findings revealed that the scale, which accounts for 56% of the total variance, consisted of 25 items and five dimensions. In line with reliability calculations, the alpha internal consistency coefficients for innate ability, quick learning, omniscient authority, simple knowledge, and certain knowledge dimensions were respectively calculated as .83, .77, .77, .71, and .64. The research results showed that scenarios based on vignettes support the multi-dimensional structure of epistemological beliefs. Several suggestions were also made regarding the use of vignette-based scenarios as a novel approach in identifying the epistemological beliefs of middle school students.

Keywords:
epistemological beliefs, middle school students, scale development, vignette, scenario

1. Introduction

Epistemological beliefs are defined as individuals' views on the nature of knowledge and knowing while making sense of life (Hofer & Pintrich, 1997). Due to the close relationship between epistemological beliefs and a number of learning-related variables, many studies have been conducted in the domain of education (Schraw, 2013). A review of the relevant literature indicates that epistemological beliefs have been conceptualized in two different ways as unidimensional developmental and multi-dimensional (Greene, Sandoval & Bråten, 2016).

The first research on epistemological beliefs based on the unidimensional developmental model was conducted by Perry (1970). Perry developed a unidimensional epistemological developmental model for the epistemological beliefs of individuals, consisting of several stages (dualism, multiplicity, relativism, commitment) that followed a certain sequence (Deryakulu, 2014). The undimensional developmental models developed based on Perry's model have similar characteristics (Baxter Magolda, 1992; Belenky et al., 1986; King & Kitchener, 1994; Kuhn et al., 2000). The epistemological development path progresses from an objectivist, dualist (black or white) understanding where authority is the source of knowledge to another understanding where individuals gain multiperspectivity and start to believe that their views are also valuable. In the last stage of this path, knowledge is not transferred by experts or authority, but rather it is produced by the individual him/herself. Knowledge has a dynamic structure that is not stable but changes according to time and place (Deryakulu, 2014).

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Recent epistemological belief researchers are of the opinion that the multi-dimensional structure of epistemological beliefs is more valid and applicable than developmental models (Hofer, 2016). The multi-dimensional epistemological belief model was first developed by Schommer (1990). Accordingly, epistemological beliefs consist of five independent dimensions (structure of knowledge, certainty of knowledge, source of knowledge, control of knowledge acquisition, and speed of knowledge acquisition).

Schommer (1994) stated that an individual's epistemological beliefs vary along the continuum from naive (undeveloped) to sophisticated (developed) beliefs and emphasized that it is not possible to make a definite distinction between them. For example, the "structure of knowledge" dimension, on the one hand, includes naive beliefs that knowledge is simple and composed of separate parts, while, on the other hand, it involves sophisticated beliefs that knowledge is tightly interconnected, integrated, and complex (Schommer-Aikins, 2002). In the "certainty of knowledge" dimension, individuals with naive beliefs believe that knowledge is unchanging and absolute, while individuals with sophisticated beliefs believe that knowledge changes in the context in which it exists. In the "source of knowledge" dimension, individuals with naive beliefs hold that the source of knowledge is experts (authority). In contrast, those with sophisticated beliefs consider the source of knowledge as both experts and evidence and reasoning. In the "control of knowledge acquisition" dimension, individuals with naive beliefs think that the ability to learn is innate and does not change. On the other hand, individuals with sophisticated beliefs believe that the ability to learn is acquired later and improvable with time and experience. Finally, in the "speed of knowledge acquisition" dimension, individuals with naive beliefs believe knowing is either "quick all" or "not at all." In contrast, those with sophisticated beliefs believe that knowing is gradual: it takes some time for individuals to learn something (Schommer, 1990).

According to Schommer (1990), these five dimensions are not necessarily synchronized. For example, a student who has naive beliefs in the source of knowledge dimension can develop sophisticated beliefs in the speed of knowledge acquisition dimension. Studies on the multi-dimensional structure of epistemological beliefs, which began with Schommer (1990), have been carried out by different researchers (Chinn, Buckland & Samarapungavan, 2011; Greene, Azevedo & Tourney-Purta, 2008; Hammer & Elby, 2002; Hofer & Pintrich, 1997), who provided different perspectives to the relevant literature.

Measuring Middle School Students' Epistemological Beliefs: An Approach based on Vignettes and Scenarios

An investigation of studies on epistemological beliefs in the domain of education showed that most of these studies have been conducted with adults (Schraw, 2013). This can be attributed to the difficulties in determining children's epistemological beliefs (Üztemur & Dinç, 2018). In studies that adopted unidimensional developmental epistemological models, middle school students' epistemological beliefs have generally been collected with qualitative data. Such studies have employed vignettes (Mansfield & Clinchy, 2002) and interviews (Duran & Mıhladız, 2014; Feucht, 2017; Yang & Tsai, 2010) as measurement tools.

In studies adopting multi-dimensional models, on the other hand, middle school students' epistemological beliefs have generally been measured through scales (Cano, 2005; Conley et al., 2004; Elder, 2002; Schommer-Aikins, Brookhart & Hutter, 2000; Schommer-Aikins, Duell & Hutter, 2005; Üztemur, Dinç & İnel, 2018). Studies using new techniques such as "draw-write-tell" that combine different data collection tools under one roof are also noteworthy (Brownlee et al., 2017; Üztemur & Dinç, 2018). In early studies adopting multi-dimensional models, various scales were developed to measure middle school students' epistemological beliefs (Conley et al., 2004; Elder, 2002; Schommer et al., 2000). These scales were adapted to many different cultures, and multi-dimensional epistemological beliefs were tested with samples consisting of middle school students. Cultural characteristics of students lead to differences in their views on the nature of knowledge and knowing (Deryakulu & Büyüköztürk, 2002; Chan & Elliot, 2004). As a consequence of this, it was seen that the items in the scale were not collected under the supposed dimensions and that different dimensions emerged (Schommer et al., 2000; Üztemur et al., 2018).

In this study, Schommer's (1990) model was used to measure the middle school students' epistemological beliefs, and vignettes and scenarios were used in combination. The vignettes involved the conversations of imaginary characters with epistemological beliefs at the two extremes (naive-sophisticated). The students were asked to explain which of these views they agreed with and why (Wainryb et al., 2004). Pajares (1992) stated that vignettes and scenarios could be used to reveal individuals' beliefs, noting that beliefs would thus be

described more effectively and more accurately. According to Grossman (1994), the use of scenarios rather than open-ended questions during classroom discussions makes it easier for students to express their views. Considering the studies which utilized scenarios as an assessment tool, the participating students were more willing to share their views with their peers after reading the scenarios. Since scenarios are built on certain events, students are better able to focus on their own views (Echiejile, 1994; Grossman, 1994; Nist & Holschuh, 2005). Similarly, vignettes allow target-oriented data collection by limiting the scope of the subject of the study. In this way, students who have difficulty expressing themselves can choose from opposing views and thus express their views more comfortably (Brownlee et al., 2017; Moschner et al., 2008).

A thorough search of the literature indicated that the studies in which children's (preschool-primary school-middle school) epistemological beliefs were measured through vignette-based scenarios adopted unidimensional developmental models (Kuhn et al., 2000; Mansfield & Clinchy, 2002; Sandoval & Cam, 2011; Wainryb et al., 2004; Walker et al., 2019; Wildenger et al., 2010). Holschuh (1998), in his study based on the multi-dimensional epistemological belief model, measured epistemological beliefs through scenarios. He compared the results of his study with university students with the results obtained from Schommer's (1990) original scale. His results showed that scenarios are useful in measuring epistemological beliefs (Holschuh, 1998). The lack of a scale in the literature to determine the multi-dimensional structure of middle school students' epistemological beliefs through vignette-based scenarios constitutes the problem of this research. Taking these as a starting point, this paper aims to develop a scale to determine the multi-dimensional structure of middle school students' epistemological beliefs through vignette-based scenarios and to make validity and reliability studies of this scale.

2. Method

2.2. Research Design

This scale development study was performed with the cross-sectional screening model. In cross-sectional studies where the sample is very large and has many different characteristics, the variables to be investigated are measured at one time (Fraenkel, Wallen & Hyun, 2012: 394).

2.2. Study Group

The study group consists of 257 middle school students, who were selected by simple random sampling technique, studying in public schools in the Manisa in the 2019-2020 academic year. Table 1 presents the demographic characteristics of the participating students.

It can be inferred from Table 1 that the participants are equally distributed in terms of their sex. When the educational background of the parents of the participants is examined, it can be said that the majority of the students' parents are middle or high school graduates. It can also be said that the participants are quite equally distributed in terms of their grades.

2.3. Steps

When developing this scale to determine middle school students' epistemological beliefs through vignette-based scenarios, we followed the steps recommended by Crocker and Algina (1986) and Cronbach (1984). These steps are given below.

1. Determination of the Structure to be measured

The "Vignette and Scenario-based Epistemological Beliefs Scale" (VSBEBS) developed in this study aims to measure middle school students' epistemological beliefs.

2. Expressing the Behaviours that meet the Structure to be measured

The vignette-based scenarios were developed on the basis of the sub-dimensions of the epistemological beliefs model developed by Schommer (1990) (structure of knowledge, certainty of knowledge, source of knowledge, control of knowledge acquisition, and speed of knowledge acquisition).

Table 1. Personal information of the participants

Variable	Category	Frequency f	Percentage %
Gender	Male	147	57.2
	Female	110	42.8
Graduation (Mother)	Uneducated	17	6.6
	Primary	90	35
	Middle	80	31.1
	High School	57	22.2
	Graduate and Postgraduate	13	5.1
Graduation (Father)	Uneducated	10	3.9
	Primary	57	22.2
	Middle	79	30.7
	High School	82	31.9
	Graduate and Postgraduate	29	11.3
Class Level	Fifth	38	14.8
	Sixth	70	27.2
	Seventh	86	33.5
	Eighth	63	24.5

3. Creation of Vignette-Based Scenarios and Item Pool

When we examined the studies in which epistemological beliefs were measured through vignettes, we realized that the vignettes involved the conversations of imaginary characters with epistemological beliefs at the two extremes. In most of these studies, the samples consisted of pre-school and primary school students. In the studies, the students were asked to state the views of which character they agreed with and why (Kuhn et al., 2000; Mansfield & Clinchy, 2002; Wainryb et al., 2004; Walker et al., 2019; Wildenger et al., 2010). In the present study, we created imaginary characters representing two opposite poles (naïve-sophisticated) of the five dimensions of epistemological beliefs in Schommer's (1990) model. Then, we stated the components of the dimension for each scenario. After each scenario, we wrote six five-point Likert-type items (strongly disagree, strongly agree). To illustrate, the scenarios and items for the control of knowledge acquisition dimension are given in Table 2.

The participating students were asked to express their level of agreement with each item. When creating the scenarios and items, studies measuring middle school students' epistemological beliefs were taken into consideration (Conley et al., 2004; Elder, 2002; Schommer et al., 2000).

4. Obtaining Expert Opinion for the Scenarios and Items

The scale consisting of five scenarios and 30 items based on the multi-dimensional structure of epistemological beliefs was submitted for the approval of three assessment and evaluation experts and one Turkish language expert. They were asked to give their opinions about to what extent the scenarios explain the relevant dimension and whether the items are consistent with the scenarios. Besides, we asked five middle school Turkish teachers about their opinions whether the scenarios and items were appropriate for the students' levels. Then, we edited the scenarios and items in accordance with the expert opinions we received.

5. Pilot Implementation

A pilot study was conducted with 36 students selected from each grade level. We asked these students if there were any words in the scenarios or items with which they were not familiar. During the pilot implementation, we realized that it took approximately 30 minutes for the students to complete the scale. Then, necessary editions were made considering the feedback of the students.

Table 2. Scenario and items for the control of knowledge acquisition dimension

Ayşe and Leyla, who both got low grades from the mathematics test, are having a conversation: **Ayşe:** *"No matter how hard I work; I still don't get math. No matter how hard I try, it's futile. As I have an innate mathematical disability, I can't succeed in this lesson. I will never be able to learn mathematics since I don't have innate mathematical intelligence. Students who are successful in mathematics do not need to study for this course because they have innate mathematical intelligence. I wish I was born with mathematical intelligence like them.* **Leyla:** "*I haven't studied enough for the math test. If I work hard enough, I'm sure I'll get high marks. If I try and work hard enough, there's no lesson I can't succeed. If I try, I can get very high grades from the math test. I don't believe in innate mathematical intelligence. When one works hard enough, one learns everything. If a student works hard and tries hard, she will solve even complex problems."*
1= Strongly disagree, 2= Disagree, 3= Undecided/not sure, 4= Agree, 5= Strongly Agree
I agree with Ayşe: to be successful in mathematics class, it is necessary to have innate mathematical intelligence.
I agree with Ayşe: students with innate mathematical intelligence do not need to study for the math lesson.
I agree with Leyla: to be successful in mathematics class, there is no need to have innate mathematical intelligence.
I agree with Ayşe: no matter how hard some students try, they cannot learn some subjects because of their innate intelligence capacity.
I agree with Leyla: if a student works hard enough, he/she can be successful in the math lesson.
I agree with Leyla: if a student works hard and tries hard, he/she will solve even complex problems.

6. Main Implementation and Analysis of the Data

The scale was applied between October and November 2019. The students were informed about the purpose of the study. In addition to the instructions in the data collection form, the researcher also provided the necessary explanations to the students about the scenarios and items. SPSS and AMOS were used for analysis. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed respectively for the construct validity of the scale. Correlation analysis was performed to detect the multicollinearity problem. Then, alpha reliability coefficient was calculated for the reliability. In order to interpret the scores obtained from the sub-dimensions of the scale, the score ranges in Table 3 were used.

Table 3. Score ranges for interpreting the scores from the sub-dimensions

Statements	**Range of Scores**	**Epistemological Belief Level**
Strongly disagree	1.00-1.80	Highly sophisticated/ highly developed
Disagree	1.81-2.60	Sophisticated /developed
Undecided/not sure	2.61-3.40	Moderately sophisticated/moderately developed
Agree	3.41-4.20	Naive/ underdeveloped
Strongly agree	4.21-5.00	Very naive/ not developed at all

It can be inferred from Table 3 that high scores from the sub-dimensions of the scale indicate underdeveloped epistemological beliefs. For ease of scoring and interpretation, items 3, 5, 6, 9, 11, 12, 15, 17, 18, 19, 21 22, 28, 29, and 30 were reverse coded. For the fit of the data obtained from CFA, the chi-square value divided by the degree of freedom ($\chi 2/df$), the root mean square error of approximation (RMSEA), adjusted goodness of fit index ((AGFI), the comparative fit index (CFI), the incremental fit index (IFI), and the general fit index (GFI) values were taken as criteria (Hu & Bentler, 1999). The criterion values of the fit indices are shown in Table 7.

In order to determine the criterion validity of the scale, the "Middle School Students' Epistemological Beliefs Scale" (MSSEBS) developed by Üztemur et al. (2018) was applied to the study group. The scale developed on the basis of Schommer's (1990) model consists of four dimensions (omniscient authority, innate ability, simple knowledge, quick learning) and 20 items (Üztemur et al., 2018). According to the results of the CFA performed to test the construct validity of the scale on the data set in this study, the fit indices of the scale were found to be excellent ($\chi 2$). Alpha internal consistency coefficients calculated in this study are as follows: Omniscient

authority (α: .82), innate ability (α: .62), simple knowledge (α: .43), quick learning (α: .56). These findings indicated that the scale developed by Üztemur et al. (2018) could be used for the criterion validity in this study.

3. Findings

Findings from EFA

Prior to performing EFA, Kaiser Meyer Olkin (KMO) and Bartlett's Test of Sphericity were performed to determine the suitability of the data for factor analysis. KMO value greater than .50 and a significant result from Bartlett's Test of Sphericity indicate that each variable in the scale can predict other variables (Field, 2013). As a result of the analyses, KMO value was calculated as .81, and the result of Bartlett's Test of Sphericity was significant (χ2= 2464.658, *df*= 300; p<.01). Then, EFA was then applied to the scale. The eigenvalues and variances of the factors are given in Table 4.

Table 4. Factor structure of vignette and scenario-based epistemological beliefs scale

Rank	Factors	Factor Eigenvalue	Percentage of Variance (%)	Total Variance Percentage (%)
1	**Innate Ability**	6.035	24.138	24.138
2	**Quick Learning**	3.058	12.232	36.370
3	**Omniscient Authority**	1.960	7.838	44.208
4	**Simple Knowledge**	1.677	6.706	50.915
5	**Certain Knowledge**	1.274	5.097	56.012

It can be inferred from Table 4 that the five-dimensional scale explains 56.01% of the total variance. According to Kline (2011), the total variance explained in multi-dimensional scales should be above 41%. The distribution of the items according to factor loadings and dimensions are shown in Table 5.

Table 5. Factor Loadings of the Items after Rotation and the Items by Dimensions

Factors	Item Number	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	15	,80				
	18	,76				
Innate Ability	**14**	,67				
	17	,67				
	13	,60				
	26		,75			
	27		,73			
Quick	**28**		,61			
Learning	**25**		,53			
	29		,48			
	30		,46			
	1			,77		
	4			,75		
Omniscient	**2**			,73		
Authority	**3**			,66		
	5			,60		
	6			,56		
	12				,74	
Simple	**11**				,69	
Knowledge	**9**				,64	
	10				,43	
	22					,74
Certain	**19**					,70
Knowledge	**21**					,67
	23					,63

It can be inferred from Table 5 that items 7, 8, 16, 20, and 24 were excluded from the scale due to the fact that their factor loadings were lower than .32 and that they had high factor loadings in more than one dimension. The factor loadings ranged from .59 to .80,from .46 to .75,from.55 to .77,from .43 to .74,and from .63 to .74for the items of the innate ability dimension, the quick learning dimension, the omniscient authority dimension, the simple knowledge dimension, and the certain knowledge dimension, respectively. To test the reliability of the scale, alpha internal consistency coefficients of each dimension were calculated. Accordingly, alpha internal consistency coefficients calculated for the innate ability, quick learning, omniscient authority, simple knowledge, and certain knowledge dimensions are .83, .77, .77, .71, and .64, respectively. These findings indicate that the scale is reliable (Cortina, 1993).

Findings from CFA

CFA was performed to confirm the factor structure obtained after EFA and to see the relationships between the resulting factor structures. Figure 1 presents the standardized value coefficients for the parameters of the model.

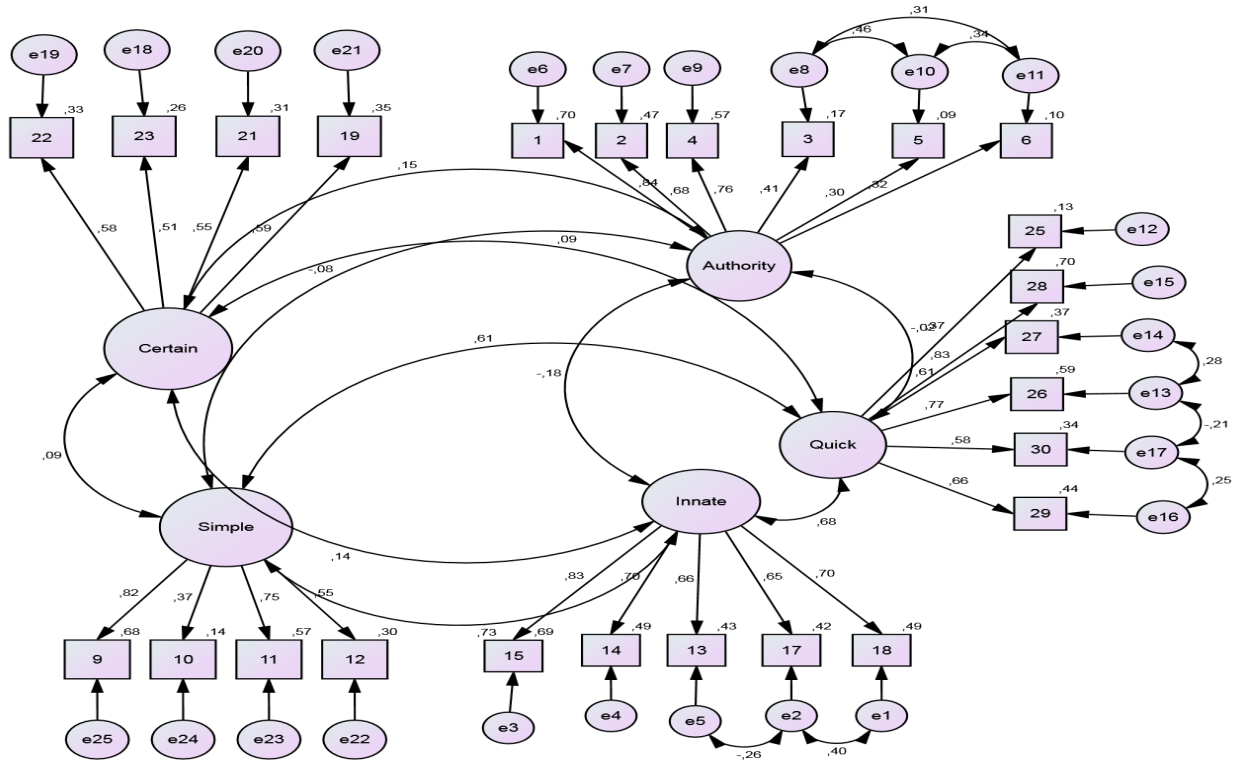

Figure 1. Standardized value coefficients for the model

As can be seen in Figure 1, the proposed modifications were made for the items under the same sub-dimension. Table 6 presents the values resulting from these modifications.

Table 6. Fit index values for the CFA model

Model	$\chi 2$	df	$\chi 2$/df	IFI	GFI	AGFI	CFI	RMSEA
The model without modification	696.107	265	2.627	.810	.826	.772	.809	.080
modification between e8 and e10	642.725	264	2.435	.834	.836	.786	.832	.075
modification between e1 and e2	599.067	263	2.278	.853	.846	.797	.851	.071
modification between e13 and e14	579.302	262	2.211	.861	.853	.805	.859	.069
modification between e16 and e17	563.002	261	2.157	.869	.866	.818	.866	.067
modification between e10 and e11	548.830	260	2.111	.891	.879	.826	.883	.066
modification between e8 and e11	524.291	259	2.024	.896	.885	.832	.889	.063
modification between e2 and e5	508.277	258	1,970	.901	.896	.846	.896	.062
modification between e13 and e17	499.166	257	1.942	.906	.903	.851	.901	.061

When the fit indices of the unmodified model are examined according to the data in Table 6, it can be seen that although RMSEA and $\chi 2/df$ values are acceptable, CFI, AGFI, IFI, and GFI values are not acceptable. In accordance with the proposed modification indices, firstly, error correlation was performed between the error variances of items 3 and 5 (e8 and e10). Following this procedure, the AMOS program was run again. The chi-square difference test ($\chi 2$ difference test) was performed to compare the resulting new model with the previous model (Tabachnick & Fidell, 2013). As a result of the chi-square difference test, the modification process made the model statistically more fit [$\chi 2$ (1, N = 257) = 53.38, p< .05]. Although there was an increase in the fit indices of the resulting new model, the findings were still not acceptable. For this reason, modifications were performed between the errors of items 17 and 18 [$\chi 2$ (1, N = 257) = 43.65, p< .05], 26 and 27 [$\chi 2$ (1, N = 257) = 19.76, p< .05], 29 and 30 [$\chi 2$ (1, N = 257) = 16.30, p< .05], 5 and 6 [$\chi 2$ (1, N = 257) = 14.17, p< .05], 3 and 6 [$\chi 2$ (1, N = 257) = 24.53, p< .05], 13 and 17 [$\chi 2$ (1, N = 257) = 16.01, p< .05] and 26 and 30 [$\chi 2$ (1, N = 257) = 9.11, p< .05]. Table 7 presents the criterion values of fit indices referenced to determine the adequacy of the final model and the fit values of the model.

Table 7. Fit values of the fit indices* and fit values of the model

Fit Indexes	Perfect Correspondence Criteria	Acceptable Correspondence Criteria	Model's Fit Indexes	Result
$\chi 2/df$	$0 \le \chi 2/df \le 2$	$2 \le \chi 2/df \le 5$	1.942	Perfect Correspondence
RMSEA	.00 ≤ RMSEA ≤ .05	.05 ≤ RMSEA ≤ .08	.06	Acceptable Correspondence
CFI	.95 ≤ CFI ≤ 1.00	.90 ≤ CFI ≤ .95	.90	Acceptable Correspondence
GFI	.95 ≤ GFI ≤ 1.00	.90 ≤ GFI ≤ .95	.90	Acceptable Correspondence
AGFI	.95 ≤ AGFI ≤ 1.00	.85 ≤ AGFI ≤ .90	.85	Acceptable Correspondence
IFI	.95 ≤ IFI ≤ 1.00	.90 ≤ IFI ≤ .95	.90	Acceptable Correspondence

*= Hu & Bentler, 1999

According to Table 7, the division of chi-square by the degree of freedom shows a perfect fit. The fact that the other fit indices are acceptable shows that the model fits the data.

Findings for Criterion Validity

To determine the criterion validity of the scale, the "Middle School Students' Epistemological Beliefs Scale" developed by Üztemur et al. (2018) was used. The correlation values between the sub-dimensions of the scales are given in Table 8.

Table 8. Findings for criterion validity of VSBEBS

	Sub factors	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EBSBVS	Innate Ability	1								
	Quick Learning	,529**	1							
	Omniscient Auth.	,005	,041	1						
	Simple Knowledge	,528**	,479**	,080	1					
	Certain Knowledge	,107	,069	,190**	,078	1				
EBSMSS	Omniscient Auth.	.138**	.176**	.721**	.114	.247**	1			
	Innate Ability	.647**	.56**	.089	.434**	.148*	,141*	1		
	Quick Learning	.482**	.68**	.074	.413**	.075	,197**	,442**	1	
	Simple Knowledge	.29**	.458**	.168*	.679**	.094	,215**	,329**	,344**	1

*: p<0.05 **: p< 0.01, VSBEBS = Vignette and Scenario-based Epistemological Beliefs Scale, MSSEBS= Middle School Students' Epistemological Beliefs Scale

According to Table 8, the sub-dimensions of VSBEBS have positively significant relationships with the sub-dimensions of MSSEBS. Therefore, it can be said that the scale has criterion validity. In addition, the correlation values of the sub-dimensions of VSBEBS are not higher than .80. The variance inflation factor (VIF) value was less than .10. In addition, the tolerance value was above .20. According to these findings, it can be said that there is no multicollinearity problem among the sub-dimensions of the scale (Field, 2013).

4. Conclusion, Discussion, and Recommendations

This study aimed to develop a scale based on vignettes and scenarios in order to determine middle school students' epistemological beliefs. Vignette and scenarios were created according to Schommer's (1990) multi-dimensional epistemological belief system. Accordingly, a scenario was prepared for the "structure of knowledge," "certainty of knowledge," "source of knowledge," "control of knowledge acquisition," and "speed of knowledge acquisition" dimensions, and six items were added under each scenario. The results of the research show that the scale, which explains 51% of the total variance, covers the five-dimensional structure of epistemological beliefs. As a result of validity and reliability studies, the scale included five dimensions and 25 items. These results are quite remarkable because they show that vignette-based scenarios are very successful in explaining the multi-dimensional structure of epistemological beliefs with a sample of middle schools. Schommer's (1990) original scale does not include the "omniscient authority" dimension, which corresponds to the "source of knowledge" dimension. Similarly, the epistemological beliefs scale developed by Schommer et al. (2000) for middle school students includes only certain knowledge, quick learning, and innate ability dimensions. The scale, which was developed by Üztemur et al. (2018) based on Schommer's (1990) model to measure middle school students' epistemological beliefs and which was used for the criterion validity in the present study, does not include the "certain knowledge" dimension. In a study conducted by Schommer-Aikins et al. (2005) with middle school students, aimless studying, constant/quick learning, certain knowledge, and omniscient authority dimensions emerged. In the study conducted by Cano (2005) with middle school students, certain knowledge, quick learning, and simple knowledge dimensions emerged. Accordingly, it is difficult to obtain the five-dimensional structure of epistemological beliefs with a sample of middle school students. In the present study, a structure measuring all five dimensions was obtained through vignettes and scenarios. This aspect of the study is valuable because even a very small number of studies with adults have been able to reveal the five-dimensional structure of epistemological beliefs (Schraw, Bendixen & Dunkle, 2002).

The scale developed by Üztemur et al. (2018) for middle school students was used for the criterion validity of the scale. There were moderately significant positive correlations among the sub-dimensions of the scales. According to these results, it can be said that the scale has criterion validity and measures the same structure as the scales in the literature. The reliability coefficients of the scale used for criterion validity were .76, .56, .49, and .35 for omniscient authority, innate ability, quick learning, and simple knowledge dimensions, respectively (Üztemur et al., 2018). In the current study, alpha internal consistency coefficients were found to be .83, .77, .77, .71, and .64, for innate ability, quick learning, omniscient authority, simple knowledge, and certain knowledge, respectively. When we reviewed the relevant literature, we saw that most of the epistemological beliefs scales based on Schommer's model and applied in different cultures and with different samples had the problem of low reliability coefficients (Bath & Smith, 2009; Chan & Elliott, 2004; Cam et al., 2012; Chan et al., 2011; Dinç et al., 2016; Nussbaum & Bendixen, 2003). In Schommer's (1990) scale, which was the first epistemological beliefs scale, alpha internal consistency coefficients ranged from .51 to .78. Even in the Epistemic Beliefs Inventory, which was developed to obtain a scale with alpha internal consistency coefficients higher than those in Schommer's (1990) scale, alpha internal consistency coefficients ranged from .58 to .68. Cam et al. (2012) stated that alpha internal consistency coefficients might be low due to cultural differences and poor translation of original scales. Considering all these results, it can be said that the reliability of VSBEBS consisting of 25 items is relatively high.

In this study, rather than Likert type scales, vignette-based scenarios were used to measure the middle school students' epistemological beliefs. Our results show that vignette-based scenarios helped the participating students understand the items better. Considering that it is not easy to measure younger students' epistemological beliefs, and it is difficult to obtain a five-dimensional structure, vignette-based scenarios based can be said to be useful. Nevertheless, since the scale is a new approach in measuring epistemological beliefs, future research can apply it with different samples and compare the results.

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