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THE ROLE OF ACHIEVEMENT IN THE CORRELATION BETWEEN TEACHER CANDIDATES' MEASUREMENT AND EVALUATION COMMON COMPETENCY PERCEPTIONS AND ASSESSMENT LITERACY

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Abstract

The aim of this study is to examine the role of achievement in the relationship between teacher candidates' perceptions of common measurement and evaluation competency and their assessment literacy. Since it was aimed to test the model that predicted the mediator variable in the research, it was designed in a relational model that tried to explain causal relationships. The study sampled 126 teacher candidates who were enrolled in a third-grade measurement and evaluation course. The "Measurement and Evaluation Common Competency Perception Scale for Prospective Teachers," the "Assessment Literacy Inventory," and the evaluation course's final grades were used for the study. As a result of the research, it was seen that achievement assumed the role of a full mediator variable in the relationship between measurement and evaluation competency perception and assessment literacy. This finding shows that the relationship between measurement and evaluation common competency perception and assessment literacy will be realized through achievement.

Keywords: assessment literacy, measurement and evaluation common competency perception, achievement, mediation analysis

ÖĞRETMEN ADAYLARININ ÖLÇME DEĞERLENDİRME GENEL YETERLİK ALGILARI VE ÖLÇME DEĞERLENDİRME OKURYAZARLIKLARI ARASINDAKİ İLİŞKİDE BAŞARININ ROLÜ

Özet

Bu araştırmada öğretmen adaylarının ölçme değerlendirme genel yeterlik algıları ile ölçme değerlendirme okuryazarlıkları arasındaki ilişkide başarının rolünün belirlenmesi amaçlanmıştır. Araştırmada aracı değişken olarak öngören modelin sınanması amaçlandığından nedensel ilişkileri açıklamaya çalışan ilişkisel bir modelde tasarlanmıştır. Araştırmanın verileri üçüncü sınıfta öğrenim gören ölçme ve değerlendirme dersi almış 126 öğretmen adayından elde edilmiştir. Araştırma verileri, "Öğretmen Adayları İçin Ölçme ve Değerlendirme Genel Yeterlik Algısı Ölçeği", "Ölçme Değerlendirme Okuryazarlığı Envanteri" ve öğrencilerin dönem sonu notlarından elde edilmiştir. Araştırmada sonucunda başarının, ölçme ve değerlendirme yeterlik algısı ile ölçme değerlendirme

okuryazarlık düzeyi arasındaki ilişkide tam aracı değişken rolü üstlendiği görülmüştür. Bu bulgu genel yeterlik algısının ölçme ve değerlendirme okuryazarlığı ile olan ilişkisinin başarı üzerinden gerçekleşeceğini göstermektedir.

Anahtar Kelimeler: ölçme değerlendirme okuryazarlığı, ölçme ve değerlendirme genel yeterlik algısı, başarı, aracılık analizi

1.INTRODUCTION

Main classroom, such as identifying the learning of the students and their learning deficiencies, as well as coming to a decision about the students, are part of the subject of measurement and evaluation (Ertürk, 1979). Teachers should have enough understanding of measurement and evaluation, as well as the ability to use this information effectively, in order to execute these tasks more efficiently.

Assessment literacy was first put forth in 1991 by Stiggins. According to Stiggins (1991), teachers who possess assessment literacy are those who are aware of what and how they measure, who can develop or select appropriate measurement and evaluation tools, who are able to present examples of student achievement, and who recognize and resolve problems. Stiggins (2002) defined assessment literacy as the capacity to grasp and utilize measurement and evaluation procedures within the educational process. Similar to Webb (2002) defined an individual with assessment literacy as one who evaluates the knowledge of the student, interprets the evaluation results, and uses the acquired results for the development of the students and the effectiveness of the education program. Popham (2006) defined assessment literacy as methods that play a definitive role in the education-related decisions of teachers and fundamental evaluation perceptions related to the principles.

Davies (2008) and Fulcher (2012) asserted that assessment literacy has three dimensions, indicating that ability, knowledge, and principles are important for assessment literacy. The first is being able to develop the measurement tools to be used in the classroom. The second is having the required ethical implementation principles for implementing tests. The last one is having the necessary knowledge and skills to understand the impact of the evaluations on individuals and having a general awareness of why the evaluations are carried out. In conclusion, assessment literacy is an important knowledge and skill that teachers are expected to have in the subject of measurement and evaluation (Fan, Wang & Wang, 2011).

Karaman and Sahin (2017) stated that assessment literacy is necessary for the effective implementation of educational practices. A teacher with assessment literacy should be familiar with not only evaluations that seek to reveal the cognitive process skills of the students in his or her classroom (Green & Mantz, 2002), but also the evaluation methods and tools that s/he can use to identify cognitive and behavioral abilities, without hesitation (Volante & Fazio, 2007). At this point, the teacher should inform the students about all the criteria to be used for evaluation so that they can continue their studies with knowledge of how they will be evaluated. It has been observed in previous studies that students with knowledge of the evaluation procedure have higher achievement levels (Wayman, Midgley & Stringfield, 2006; Wiliam, Lee, Harrison & Black, 2004).

As a result, as Newfields (2006) points out, measurement and evaluation are an integral element of all educational systems, serving as a tool for determining the efficacy of educational programs and also as a mirror for instructors' performance. Considering this, measuring and encouraging the evaluation literacy of teachers has been the primary focus for the last two decades (Deluca, LaPointe-McEwan & Luhanga, 2016).

The essential position of evaluation in student learning and the teacher's critical role in student evaluation may be cited as grounds for growing interest in the relevant literature on assessment literacy. It is important that the teacher is literate in measurement and evaluation, in addition to considering himself/herself competent in this subject. According to Heritage (2007), incompetence of educators in the field of measurement and evaluation may be considered among the reasons for the low levels of literacy among teachers. Accordingly, the measurement and evaluation fields of competence of educators were tried to be outlined.

Measurement and evaluation standards were put forth in 1987 with the cooperation of the American Federation of Teachers (AFT), National Council on Measurement in Education (NCME) and the National Education Association (NEA). Within the scope of this project, the measurement and evaluation competencies were defined as the skills and abilities that teachers should possess (AFT,

NCME & NEA, 1990). Accordingly, based on these standards, a) teachers should be skilled at choosing evaluation methods appropriate for instructional decisions, b) teachers should be skilled at developing evaluation methods appropriate for instructional decisions, c) teachers should be skilled at administering, scoring, and interpreting the results of both externally-produced and teacher-produced evaluation methods, d) teachers should be skilled at using evaluation results when making decisions about individual students, planning teaching, developing curriculum, and school improvement, e) teachers should be skilled at communicating evaluation results to students, parents, other lay audiences, and f) teachers should be skilled at recognizing unethical, illegal, and otherwise inappropriate evaluation methods and uses of evaluation information.

The Ministry of National Education (2002) defined teachers' measurement and evaluation competencies as follows: "Identifying the measurement and evaluation method suited for the objective, determining the student performance criteria, conducting written examinations, conducting oral examinations, conducting right-wrong type tests, conducting completion tests, conducting multiple choice tests, identifying the validity and reliability of the developed measurement tools, homework and project assessment, student work folder assessment, informing the school management of the evaluation results, providing feedback to the parents of the students, conducting absolute evaluation and relative evaluation, ensuring the participation of the students in the evaluation process, self-assessment of the instruction provided, helping the students to assess himself/herself, providing feedback to the student, conducting performance tests and attitude measurement."

Studies (Aksu, 2012; Beziat & Coleman, 2015; Birgin & Baki, 2009; Childs & Lawson, 2003; Çakan, 2004; Davidheiser, 2013; Daniel & King, 1998; Gelbal & Kelecioğlu, 2007; Güven, 2001; McDonald, 2002; Mertler, 2003; Mertler & Campell, 2005; Özsevgeç, Çepni & Demircioğlu, 2004; Karaman, 2014; Karaman & Şahin, 2014; Kuran & Kanatlı, 2009; Ogan-Bekiroğlu & Suzuk, 2014; Schafer & Lissitz 1987; Stiggins, Conklin, & Bridgeford, 1986; Tao, 2014; Ulutaş, 2003; Volante & Fazio, 2007; Yamtim & Wongwanich, 2014). corresponding to these fields of competence identified in relation to measurement and evaluation indicate that the assessment literacy and competence levels of teachers are low. The fact that teachers have such low levels of measurement and evaluation was considered by Plake (1993) to be due to the insufficiency of the education they received prior to starting their profession. Mertler (1999) also put forth that teacher candidates do not acquire sufficient skills to evaluate students after taking the measurement and evaluation course that is part of their curriculum. Similarly, Daniel and King (1998) identified that teachers do not have comprehensive knowledge of the subjects of measurement and evaluation. It was illustrated that teachers especially lack simple statistical knowledge used in measurement and evaluation activities. Beziat and Coleman (2015) identified that the education related courses taken by pre-service teachers do not have an impact on their assessment literacy levels. Acar Güvendir and Özer Özkan (2016) conducted a research with beginning teachers and discovered that they were capable of incorporating all subjects into their instructional practices, with the exception of the statistical subjects covered in the measurement and evaluation course. Additionally, the teachers in their study stated that they felt incompetent since they were unable to design questions appropriate for the students' levels. Accordingly, Mertler (1999) reported that prospective teachers mostly believe they can acquire experience in measurement and evaluation after they start their professional careers. Zhang and Burry-Stock (2003) corroborate this conclusion by stating that the more measurement and evaluation procedures instructors employ, the more competent they feel. In conclusion, it is critical to examine the impact that achievement in the measurement and evaluation course has on one's impression of measurement and evaluation competence.

This research aims to determine the role of achievement in the relationship between teacher candidates' perceptions of measurement and evaluation common competency and their assessment literacy. For this purpose, answers were sought to the following questions:

1. Does the measurement and evaluation achievement and common competency perceptions of teacher candidates predict the level of assessment literacy?
2. Does achievement play a mediator role in the correlation between measurement and evaluation common competency perceptions and the level of assessment literacy?

2. METHOD

2.1. Research Model

This research used a relational model to evaluate the model that predicts students' measurement and evaluation achievement as a mediator variable in the relationship between common competency perception and assessment literacy.

2.2. Study Group

The study group consisted of 126 teacher candidates who had completed the measurement and evaluation course. Of these teacher candidates, 84% were female and 16% were male.

2.3. Data Collection Tools

The "Measurement and Evaluation Common Competency Perception Scale for Prospective Teachers" developed by Nartgün (2008) along with the "Assessment Literacy Inventory" adopted into Turkish by Bütüner, Yiğit and Çimer (2010) were used in the study. The achievement scores of the students were acquired from the end of semester grades of the students for the Measurement and Evaluation course.

2.3.1. Measurement and Evaluation Common Competency Perception Scale for Prospective Teachers

The scale was developed by Nartgün (2008) to identify the common competency perceptions of prospective teachers regarding the field of measurement and evaluation. The scale included 24 three-dimensional items. The first dimension consisted of six items measuring the competencies related to "primary concepts"; the second dimension included nine items on "measurement techniques", and the third dimension consisted of nine items on "statistical analysis and reporting". Each item on the 5-point Likert type scale is scored, ranging from I am very competent=5 to I am very incompetent=1. Thus, the scores that can be obtained from the scale vary between 24 and 120. The total variance explained by the three factors on the scale was 64.875%. The total variances explained by each factor as a result of variance rotation were 22.13, 22.00 and 20.75 respectively. The internal consistency reliability coefficients for the dimensions and the scale as a whole were 0.84; 0.79; 0.77 and 0.87 respectively. The test-re-test reliability coefficient of the scale was 0.91.

2.3.2. Assessment Literacy Inventory

Adopted into Turkish by Bütüner et al. (2010) in order to identify the assessment literacy of teachers and prospective teachers. The inventory includes 30 multiple-choice questions with four choices designed on a scenario basis. It was observed that the KR-20 reliability coefficient was 0.86, the mean item difficulty was 0.64 and the mean item discrimination value was 0.49.

2.4. Data Analysis

Mediation analyses were conducted at a statistical significance level of $\alpha = .05$ using version v. 1.8 of jamovi (The jamovi Project, 2021) which is used for conducting analyses based on the R statistics language. Jamovi's medmod module was used for testing whether there is any mediator effect or not (Gallucci, 2020).

Assumptions about regression analysis were first tested prior to mediation analysis. One of the assumptions of regression analysis is that the predicted and predictor variables should be continuous variables measured at an equal interval scale in addition to displaying normal distribution (Büyüköztürk, 2005). Coefficients of skewness and kurtosis along with normality tests were used to identify whether the data displays a normal distribution or not. The skewness value for common competency perception was -0.057, coefficient of kurtosis was -0.456; skewness value for the literacy score was -0.548, coefficient of kurtosis was -0.096 and the skewness value for the achievement scores was -0.921 and the coefficient of kurtosis was 0.991. It can be stated that the data do not deviate excessively from the

normal (Tabacknick & Fidell, 2007). Scattering diagram was used to examine as part of the second assumption whether there is a linear correlation between the variables or not, as a result of which it was concluded that there is a linear correlation between the variables ($R^2=0.12$). VIF and tolerance values were examined to identify whether there is a multicollinearity problem between the predictor variables or not. VIF values of measurement literacy and common competency scores were 1.04 and below 10, whereas the tolerance values were 0.96 and above 0.20. Therefore, there is no multicollinearity between the predictor variables. Mahalanobis distances were calculated since the outlier values disrupt the accordance of the regression equation to the theoretical model (Can, 2017). Three outliers at a statistically significant level of $p<.001$ with values above 9.21 were identified and excluded from the Mahalanobis distance. Analyses were conducted on 126 individuals. Baron and Kenny (1986) indicated that three important conditions should be attained in order during the analysis in order to be able to conduct the mediation analysis. The first condition was that there should be a statistically significant correlation between the predictor variable (measurement and evaluation common competency perception) and the mediator variable (measurement and assessment achievement). Findings on this condition are presented in Table 1.

The "Measurement and Evaluation Common Competency Perception Scale for Prospective Teachers" developed by Nartgün (2008) along with the "Assessment Literacy Inventory" adopted into Turkish by Bütüner et al. (2010) were used in the study. The achievement scores of the students were acquired from the end of semester grades of the students for the Measurement and Evaluation course.

Table 1. *The relationship of the predictor variable with the mediator variable*

Predictor	B	SE	95% CI		t	p	β	95% CI	
			Lower	Upper				Lower	Upper
Intercept	50.40	7.79	34.99	65.8	6.47	<.001			
Measurement and evaluation common competency perception	6.88	2.25	2.42	11.3	3.05	.003	.265	.0931	.436

It can be seen when Table 1 is examined that the standardized regression coefficient is statistically significant ($\beta=0.27$; <0.05). Thus, it can be indicated that the first condition has been met. Table 2 presents the findings of the analysis conducted for the second condition to identify whether there is a statistically significant correlation between the mediator and predicted variables.

Table 2. *The relationship of the mediator variable with the predictor variable*

Predictor	B	SE	95% CI		t	p	β	95% CI	
			Lower	Upper				Lower	Upper
Intercept	34.990	3.6879	27.6906	42.289	9.49	<.001			
measurement and evaluation achievement	.185	.0490	.0884	.282	3.78	<.001	.322	.153	.490

It can be stated that the standardized regression coefficient obtained for determining the correlation between the mediator variable of measurement and evaluation achievement and assessment literacy

($\beta=0.32$; $p<0.01$). The final condition was the requirement for a statistically significant correlation between the predictor and the predicted variables. Table 3 shows the findings for this condition.

Table 3. *The relationship of the predictor variable with the predicted variable*

Predictor	B	SE	95% CI		t	p	β	95% CI	
			Lower	Upper				Lower	Upper
Intercept	38.49	4.56	29.470	47.51	8.44	< .001			
measurement and evaluation of common competency perceptions	2.99	1.32	.377	5.59	2.26	.025	.199	.0251	.373

It can be observed that the standardized regression coefficient in Table 3 is statistically significant ($\beta=0.199$; $p<0.01$). Based on these findings, it is possible to state that all three conditions indicated by Baron and Kenny (1986) for mediation analysis have been met. The predictor variables of the study were the measurement and evaluation of common competency perceptions of the students, and dependent variable assessment literacy levels. Whereas the mediator variable was measurement and evaluation achievement. The model has been schematized Figure 1.

Figure 1. Mediation model

The c path in the model shows the direct correlation between the predictor variable of measurement and evaluation common competency and the (dependent) variable of assessment literacy. The a and b paths together present an indirect correlation. If both direct and indirect correlations are present in the model, this is defined as partial intermediation, while the presence of only an indirect correlation without any direct correlation is defined as full intermediation. In other words, full mediator correlation is present if the axb path is statistically significant while the c path is not.

3. RESULTS

Mediation analysis was conducted during the present study in order to identify the role of achievement in the correlation between the assessment literacy levels of teacher candidates and their common competency perceptions. Table 4 presents the intermediation predictions.

Table 4. *Indirect and Total Effects*

Effect	Path	Estimate	SE	95% C.I.		Z	p
				Lower	Upper		
Indirect	$a \times b$	1.15	0.507	0.153	2.14	2.26	0.024
Direct	c	1.84	1.300	-0.708	4.39	1.42	0.157
Total	$c + a \times b$	2.99	1.308	0.423	5.55	2.28	0.022

The results on Table 4 show that there are two correlations: direct and indirect. The direct correlation is not statistically significant ($p=.157$) while the indirect correlation is statistically significant ($p=.024$). This finding is an indication of the presence of a complete mediator correlation. In other words, full mediator correlation is present if the axb path is statistically significant while the c path is not. Thus, it can be indicated when the statistical significance of the indirect correlation in the first line ($p=.024$, $p<.05$) is examined, that measurement and evaluation course achievement has taken on a mediator role in the correlation between the assessment literacy levels and the measurement and evaluation common competency perceptions. Table 5 presents the path analysis predictions for the model obtained as a result of the mediation analysis.

Table 5. *Path analysis predictions for the mediation model*

Effect		Path	Estimate	SE	95% C.I.		Z	p
					Lower	Upper		
Measurement and Evaluation Common Competency Perception	Measurement and Evaluation Achievement	a	6.877	2.2336	2.4993	11.255	3.08	.002
Measurement and Evaluation Achievement	Assessment Literacy	b	.167	.0500	.0686	.265	3.33	<.001
Measurement and Evaluation Common Competency Perception	Assessment Literacy	c	1.840	1.3000	-.7081	4.388	1.42	.157

It can be observed when the correlations between the variables in Table 5 are bilaterally examined that there is a statistically significant correlation between the measurement and evaluation common competency perception and measurement and evaluation achievement ($p=.002$, $p<.05$). Measurement and evaluation achievement along with common competency perception are both correlated with literacy ($p<.001$). It can be interpreted when the prediction coefficients are examined that, while positive coefficients indicate an increase in course achievement due to measurement and evaluation common competency perceptions, it can also be indicated that measurement and evaluation course achievement increases assessment literacy. The fact that measurement and evaluation common competency perception is not directly correlated with assessment literacy, the fact that achievement intermediation leads to a statistically significant correlation, indicates that course achievement acts as a full mediator for this correlation. In other words, it can be indicated that the correlation between measurement and evaluation common competency perception and assessment literacy is actualized by way of measurement and evaluation course achievement.

5. CONCLUSION AND DISCUSSION

The study findings show that achievement plays a full mediation role in the correlation between the assessment literacy and common competency perceptions of teacher candidates. This result indicates that relationship between measurement and evaluation common competency perception and assessment literacy will be realized through achievement.

Davies (2008) and Fulcher (2012) refer to knowledge, skills, and principles as important elements of the assessment literacy level. Therefore, the level of competence felt by the teachers in this subject is also an indication of the skills they possess. At this point, it would be expected that the measurement and evaluation of competency perceptions of teachers are related to their literacy levels. In this regard, it was identified as part of the first sub-objective of the present study whether the measurement and evaluation of course achievements and common competency perceptions of teacher candidates predict their literacy levels or not as a result of which it was concluded that measurement and evaluation of common competency perception predicts literacy level by itself.

Knowledge is another important element of the assessment literacy level. Having sufficient knowledge on the part of the teachers will also make them literate on this subject. It is especially expected in the field of measurement and evaluation, which requires a theoretical background, that the accumulated knowledge of the student should be correlated with his/her literacy level. At this point, it was concluded that achievement in measurement and evaluation courses is a predictor of literacy level. This result is also supported by Koç and Bulut (2020). According to Koç and Bulut (2020), prospective teacher who successfully completed the measurement and evaluation course with a grade of AA have higher literacy levels in measurement and evaluation compared with teacher candidates with scores of BA and CC. This result indicates that the academic achievement status of teacher candidates in measurement and evaluation courses is correlated with their assessment literacy levels. Contrary to this, Beziat and Coleman (2015) reported that assessment literacy plays a critical role in the education of teacher candidates. They observed in the longitudinal study conducted that the course that teacher candidates took part in prior to starting their professional services did not have an impact on their assessment literacy levels. They suggested conducting further detailed studies to monitor the reasons for this. Alkharusi, Kazem and Al-Musawai (2011) carried out a study illustrating that the addition of a subject-based experience component to undergraduate measurement and evaluation courses will enable teachers to implement the acquired content directly into actual classroom environments. This finding attracts attention to the importance of learning experience and practice. For this purpose, the contribution of measurement and evaluation courses to the literacy levels of the students may be low when they are not integrated with implementation.

In this case, achievement and competency level (knowledge and skills – Davies, 2008; Fulcher, 2012) should be taken into consideration together as two important elements of assessment literacy level. It was concluded within the scope of the study that competency level is not a predictor of literacy level when the variables of achievement and competency perception were considered as predictors of the literacy variable. This result shows that the achievement variable may be an mediator variable. The findings acquired by Koç and Bulut (2020) support this result. They reported in their studies that even if teacher candidates are successful in the measurement and evaluation course, this comprehensive single semester course is not sufficient to make them more competent in the field of measurement and evaluation. Accordingly, it was put forth as part of the second sub-objective of the present study whether achievement plays an mediator role in the correlation between the measurement and evaluation of common competency perception and the assessment literacy level. In conclusion, the measurement and evaluation course achievement of teacher candidates plays an mediator role in the correlation between measurement and evaluation common competency perception and assessment literacy level. This finding illustrates that the correlation between measurement and evaluation common competency perception and assessment literacy will actualize through achievement. In other words, it can be stated that the common competency perception establishes a correlation with literacy solely by way of the achievement variable. Schunk (1995) also emphasized that self-efficacy is not the only factor acting on behaviors, indicating that high self-efficacy will not ensure high performance even at high levels of self-efficacy if the required knowledge and skills are missing. At this point, the correlation of two important variables with literacy is undisputable.

It is observed that teachers with only theoretical knowledge of measurement and evaluation struggle with measurement and evaluation when they start their professional lives (Acar Güvendir & Özer Özkan,

2016). Because, as put forth by Mertler (1999), the measurement and evaluation courses taken by teacher candidates are not at a sufficient level to improve their related skills. For this reason, teacher candidates have indicated that they cannot have the required skills for evaluating students after taking the measurement and evaluation course. They indicate that achievement in this course is not sufficient to help them consider themselves competent. However, they are of the opinion that they will be competent if they can put into practice their acquired knowledge in the classroom to evaluate the cognitive, affective, and behavioral process skills of the students. They are of the opinion that acquiring professional experience in measurement and evaluation is of critical importance (Mertler, 1999; Zhang & Burry-Stock, 2003).

In conclusion, course achievement by itself is not sufficient for having assessment literacy. Therefore, it can be indicated that the literacy levels of teachers will increase further when achievement is coupled with experience. This finding is explained by Bandura (1997) as such; according to him, there are four important sources of knowledge for improving the concept of self-efficacy. These are; mastery experiences, vicarious experiences, verbal persuasion, and physiological reactions. Similarly, Bandura and Locke (2003) asserted that the self-efficacy beliefs of individuals are to a great extent related to their previous experiences. Therefore, achievement as an important indicator of previous performance may be effective in improving competency while also having an adverse impact on the role played by common competency through intermediation to literacy.

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