



Article History

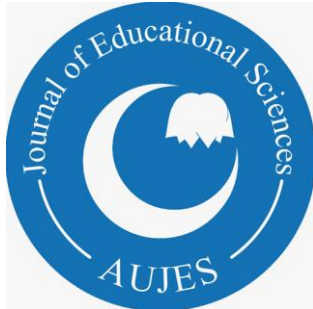
Received: 21.06.2020

Received in revised form: 23.05.2021

Accepted: 29.05.2021

Available online: 29.06.2021

Article Type: Research Article





ADIYAMAN UNIVERSITY
Journal of Educational Sciences
(AUJES)

<https://dergipark.org.tr/tr/pub/adyuebd>

**Measurement and Assessment Literacy
Levels of Teachers in Terms of Some
Variables**

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To cite this article:

Ergül, A. Ö. & Çetin, S. (2021). Measurement and assessment literacy levels of teachers in terms of some variables. *Adiyaman University Journal of Educational Sciences*, 11(1), 26-35.

Measurement and Assessment Literacy Levels of Teachers in Terms of Some Variables

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Abstract

Measurement and assessment literacy of teachers is important not only to measure student performance but also to evaluate the functioning of the education system and to decide whether the education given by teachers is qualified. In this study, assessment literacy inventory was applied to 189 secondary school teachers from different branches to determine teachers' measurement and assessment literacy levels. It was discovered that the measurement and assessment literacy level of the teachers was low. It was also found that measurement and assessment literacy levels of the teachers significantly differ by professional seniority and branch. Also, in the study item examination skill test was applied to secondary school mathematics teachers to determine the relationship between secondary school mathematics teachers' measurement and assessment literacy levels and their skill to examine items appropriate to attainment and grade level. A moderately significant positive correlation was found between the teachers' skill to examine items appropriate to educational attainment and grade level, and their measurement and assessment literacy levels. Due to the low measurement and assessment literacy level of secondary school teachers, studies such as seminars or training on this subject can be conducted. Practical activities can also be conducted along with the theoretical information on the subject.

Keywords: Measurement and Assessment Literacy, Teacher Competencies, Item Examination Skills

Introduction

The general aim of education is to equip individuals with the knowledge and skills required by the era and make them ideal individuals for their society. Individuals should be trained in a way to be able to adapt and make a contribution to adjustments and trends in the world and society. This can be ensured by qualified teachers along with a good education system (Dilaver, 1996). Education is a process and this process has three basic components: teacher, student, and curriculum. Raising individuals with the desired characteristics and ensuring quality, effective and efficient education is straight associated with the tightness of the hyper between these three primary elements. The most important role among these components belongs to the teacher (Arslan & Özpınar, 2008; Bulut, 2009; Kavas & Bugay, 2009; Kuş & Çelikkaya, 2010).

Teacher competence refers to the knowledge, skills, and attitudes that teachers will need to have to be able to find a way to meet the education career successfully and efficiently. The fact that teachers have these competencies is very important in increasing students' success and developing student personality (MEB, 2017a). In other words, the development of teachers' professional competencies increases the quality of education (Aybek, 2017).

Newfields (2006) explained the importance of measurement and assessment as follows. Measurement and assessment are a common part of all education systems in the world. It helps to understand how education programs work and enables teachers to see their performance. The more convenient and efficient the measurement and assessment applications are used, the more the student's learning performance will increase (Mertler & Campbell, 2005). Measurement and assessment help to determine and interpret student's readiness and to correct the deficiencies with the results obtained, so the student's learning quality is improved (Black & Williams, 1998). According to the studies, teachers spend 50% of their time with activities that include measurement and assessment (Plake, 1993). This very importance of measurement and assessment has brought along many pieces of research examining the competencies of teachers in measurement and assessment.

The concept of literacy is generally defined as the ability to read and write, but other than that, it is also used in the sense of knowledge and competence of individuals in a particular subject area (Koh, Burke, Luke, Gong, & Tan, 2017). Measurement and assessment literacy is the knowledge and skill of right management to

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detect the effectiveness of the curriculum and to evaluate students' success by selecting, developing, applying, scoring, managing, informing, and transmitting the results of the measurement tools in line with ethical rules and principles (Koh, et al., 2017).

The concept of measurement and assessment literacy was first introduced in 1991 by Richard Stiggins. According to Stiggins, measurement and assessment literate educators comprehend what they measure, why they measure, how they measure, what are the possible problems related to measurement, and the way to forestall these problems. It is also argued that educators are acquainted with the miserable penalties of improper and insufficient assessment. (Stiggins, 1991).

Measurement and assessment literacy consists of understanding basic measurement and assessment concepts and procedures that affect an individual's decisions about education (Popham, 2018). Fundamental concepts of measurement and assessment such as validity, reliability, and fairness refer to the methods and procedures used when creating or evaluating a test. Measurement and assessment literacy is the ability of a teacher to measure, interpret what the students learned, and use the measurement and assessment results obtained to improve student's learning and improve the quality of education provided (Webb, 2002).

A measurement and assessment literate teacher should be able to choose the most appropriate measurement tool to realize teaching achievements (Gottheiner & Siegel, 2012). They need to have the ability to appreciate the reliability of this measurement and assessment tool, know the concepts such as reliability and validity, and be aware that these concepts are effective in making educational decisions (Popham, 2011). A teacher who is measurement and assessment illiterate falls into a systematic error because s/he cannot ensure the reliability and structural validity of the measurement tool to be used, and this endangers the education system by making false assessments and taking false decisions (Lai Waltman, 2008).

In a study conducted in 2006, Newfields explained the importance of measurement and assessment literacy for three persuasive reasons. First, measurement and assessment are common features of many education systems. Teachers spend greater than half their time on measurement and assessment activities, and most school budgets and time are spent on standardized tests. Second, it provides an understanding of the literature on education. Understanding the basic statistical concepts provides a critical approach to a piece of research, otherwise, the research moves away from the reality of science and unfounded knowledge emerges. Finally, being a measurement and assessment literate teacher allows conveying results about the general condition of the class to others. In this way, the teacher shares his research with other colleagues and results that encourage learning.

Measurement and assessment competencies are the knowledge and skills that a teacher should have as an educator. The inadequacy of teachers in measuring and evaluating student development has revealed the need to develop measurement and assessment competence standards (AFT, NCME & NEA, 1990). The first study on measurement and assessment standards was conducted in 1987 in collaboration with the American Federation of Teachers (AFT), the National Council on Measurement in Education (NCME), and the National Education Association (NEA). This project, carried out by the committees, was completed in 1990. In time, many committees and researchers made efforts to develop standards similar to those established by this committee. One of these is the 11-item measurement and assessment standards developed by Brookhart in 2011 by improving the 1990-standards. In Turkey, the first studies on teacher competencies started in 1998. The current version is given by examining the teacher competence documents of organizations such as the International Labor Organization (ILO), the Organization for Economic Development and Cooperation (OECD), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the European council and countries such as Finland, England, Canada, and Singapore. (MEB, 2017). Table1 presents the measurement and assessment standards prepared by this committee and individuals.

Table 1. Measurement and Assessment Standards

AFT, NCME, and NEA (1990)	Brookhart (2011)	MoNE (Ministry of National Education) (2017)
To have the ability to select measurement and assessment methods suitable for teaching decisions	To have the knowledge of subject area related to the field	To prepare and use measurement and assessment tools suitable for students' developmental features
To have the ability to develop measurement and assessment methods suitable for teaching decisions	To reveal the situations that are compatible with the content and depth of thought determined by the curriculum objectives and standards during the assessment	To use process and result-oriented methods in measurement and assessment
To have the ability to interpret,	To have a strategy to communicate	To make measurement and

score and manage the results of measurement methods	with students about their success	assessment objectively and fairly
To have the ability to use measurement and assessment results when making decisions about education	To know the philosophy, purpose, advantages and disadvantages of the assessment methods preferred	To provide accurate and constructive feedback to students and others according to the results of measurement and assessment
To have the ability to develop a valid grading system to be used in student assessment	To make item analysis of questions, to know performance assessment content for thought skills and special information	To rearrange the teaching and learning processes according to the results of measurement and assessment
To have the ability to transmit measurement results to students, parents, educators and individuals	To have the ability to provide feedback that is useful and effective in activities of the students	
To be aware of ethical and illegal practices	To have the ability to create a scoring key for student success assessment	
	To have the ability to interpret the results of decisions related to students, class, school and regions and to manage external assessments	
	To be able to explain and interpret the decisions taken according to the results of the assessment to the people they serve with related reasons	
	To ask students for help in using assessment information to give correct education decisions	
	To know the responsibilities required for the assessment process to be legal and ethical	
AFT, NCME, and NEA (1990)	Brookhart (2011)	MoNE (2017)

As these statements point out, measurement and assessment are an integral part of education. Measurement and evaluation literacy has become necessary to determine the functioning of the education system, to establish if the education given by teachers is eligible and to improve the success of pupils. This study measures the teachers' measurement and assessment literacy levels with improving, regulatory and regenerative data, and investigates the relationship between the measurement and assessment literacy levels of secondary school teachers with respect to various variables.

Purpose and Importance of the Research

The study aims to determine the measurement and assessment literacy levels of secondary school teachers, to examine which teacher competence is deficient, and to reveal the relationship between measurement and assessment literacy and various variables (professional seniority, branch, and item examination skills).

The more appropriate and efficient the measurement and evaluation applications are used, the more the student's learning performance will increase. The student's readiness is determined, interpreted and the student's deficiencies are eliminated with the assessment and evaluation, thus the quality of the student's learning is improved. Also, considering the measurement tools that are not suitable for the purpose (acquisition), whose reliability and validity are not investigated, and the teachers' inability to score, interpret and manage the results of assessment and evaluation, it is very difficult to interpret successful or unsuccessful in educational activities, even to say that this situation is more harmful than the benefit of education.

The competencies of teachers in the field of measurement and assessment are the determiner of both the education and the future of the student. This study is important to measure the teachers' measurement and assessment literacy levels, to determine deficiencies in this field, to reveal the relationship between measurement and assessment literacy and the variables of professional seniority, branch and item examination skills, and to take reformative, regulatory and renovator precautions in line with the analysis of the obtained data, in other words, results.

Research Problem

How are the measurement and assessment literacy levels of secondary school teachers with respect to various variables?

The sub-problems of the study can be listed as follows.

1. How are the measurement and assessment literacy levels of secondary school teachers?
2. Do the measurement and assessment literacy levels of secondary school teachers differ significantly in terms of professional seniority and branch?
3. What is the correlation between secondary school mathematics teachers' measurement and assessment literacy level and their ability to examine items appropriate to educational attainment and grade level?

Method

Survey research which is one of the quantitative research types was used in the study. Survey research is a study that includes the use of a questionnaire to collect data from a sample of elements drawn from a population. In this type of research, the relationships between the variables measured in the study can also be looked at (Büyüköztürk, Kılıç, Akgün, Karadeniz & Demirel, 2016). In this current study assessment literacy inventory was applied to secondary school teachers to determine teachers' measurement and assessment literacy levels. Also, the item examination skill test was applied to secondary school mathematics teachers to determine the relationship between secondary school mathematics teachers' measurement and assessment literacy levels and their skill to examine items appropriate to attainment and grade level.

Study Group of the Research

The study group of this current study has consisted of 189 secondary school teachers working in different schools in a big-scale city in the Eastern Anatolia region of Turkey. The convenience sampling method was used to select teachers.

Table 2. Demographic Features of Study Group

		Frequency	Percentage
Gender	Female	92	48.7
	Male	97	51.3
Professional Seniority	0-4	75	39.7
	5-9	64	33.9
	10 and above	50	26.5
Education level	Undergraduate	171	90.5
	Master	18	9.5
Branch	Mathematics	54	28.6
	Turkish language	35	18.5
	Physical sciences	20	10.6
	Social studies	18	9.5
	English language	24	12.7
	Education of religion	18	9.5
	Other	20	10.6
MoNE In-Service Training	Yes	56	29.6
	No	133	70.4
	Total	189	100

As can be seen in Table 2, 48.7% (n = 92) of the teachers who participated in the study are female; 51.3% (n = 97) are male teachers. 39.7% of the participants (n = 75) were teachers whose professional seniority varied between 0-4 years, 33.9% (n = 64) were teachers whose professional seniority varied between 5-9 years and 26.5% (n = 50) are teachers with professional seniority of 10 years or more. 28.6% of the participants (n = 54) were mathematics teachers and 70.4% (n = 133) of the teachers who participated in the study did not receive in-service training on measurement and assessment in MoNE.

Data Collection Tools

The measurement tool used for the study consists of three parts: personal information form, measurement and assessment literacy inventory, and item examination skill test.

Personal Information Form: In the form, questions are included regarding the teachers' personal information, gender, education level, professional seniority, branch, and in-service training on measurement and assessment in MoNE.

The Assessment Literacy Inventory (ALI): Test developed by Mertler and Campell in 2005 was adapted into Turkish by Bütüner et al. in 2010. The Turkish form of the inventory was used in this study. This inventory, which allows not only to determine the assessment literacy levels of teachers but also to detect which teachers have deficiencies in certain competence areas, consists of five scenarios each containing six questions. ALI has been prepared in parallel with the teacher competence standards required in the educational assessment of students. Table 3 shows which items in the inventory provide information about related standards.

Table 3. Distribution of Items in Assessment Literacy Inventory by Standards

Teacher Competence Standards	Items
1. Teachers should be skilled in choosing assessment methods appropriate for instructional decisions.	1, 7, 13, 19, 25
2. Teachers should be skilled in developing assessment methods appropriate for instructional decisions.	2, 8, 14, 20, 26
3. The teacher should be skilled in administering, scoring and interpreting the results of both externally-produced and teacher-produced assessment methods.	3, 9, 15, 21, 27
4. Teachers should be skilled in using assessment results when making decisions about individual students, planning teaching, developing curriculum, and school improvement.	4, 10, 16, 22, 28
5. Teachers should be skilled in developing valid pupil grading procedures which use pupil assessments.	5, 11, 17, 23, 29
6. Teachers should be skilled in communicating assessment results to students, parents, other lay audiences, and other educators.	6, 12, 18, 24, 30

The Kuder-Richardson Reliability Coefficient (KR20) of the inventory containing 30 items in total was calculated as 0.86.

The Item Examination Skill Test: The test was prepared by the researchers. The form contains 7 multiple choice math items that are suitable for different grade levels (5, 6, 7, and 8th grade) of the secondary school. While determining the items to be put in the test, the questions of the common exams held by MoNE, whose level was determined according to class level, attainment, and Bloom taxonomy, were used. Respondents were asked to find out the grade level, learning outcome, and Bloom taxonomy level of these items.

When preparing an achievement test, items with medium difficulty, high discrimination power, and suitable for attainment and student-level should be placed in the measurement tool. At the same time, it is important to prepare the questions to be used in these tests in different forms according to Bloom Taxonomy (Linn & Gronlund, 1995). Otherwise, an improper measurement tool will result in incorrect evaluation. In this case, it leads to wrong decisions about education. According to teacher competencies, a teacher should have the ability to select and develop appropriate assessment and evaluation methods (AFT, NCME & NEA, 1990).

The test, which includes 21 items in total, includes 3 items related to the above-mentioned concepts of each of the 7 multiple-choice math items. To determine the reliability of the test, it was applied to 224 secondary school mathematics teachers. The results were analyzed using TAP (Test Analysis Program) and the reliability of the 21-item test was calculated as 0.57. Keohe (1995) stated that the reliability coefficient is acceptable around 0.50 in short tests with 10-15 items, and above 0.80 in tests with 50 or more items. Besides, in the literature, the mean of the correlations between items is ideal between 0.20 and 0.40. The values determined indicate that the items are homogeneous enough and contain the original variance. In the developed test, the correlation value between the mean items was 0.21. These values show that the test is reliable (Tabachnick & Fidell, 2007).

Results

Results on the First Sub-Problem

Results regarding the measurement and assessment literacy levels of teachers, the first sub-problem of the study, are presented in Table 4.

Table 4. Measurement and assessment Literacy Levels of Teachers

Standard	\bar{X}^*	SS
1. Choosing appropriate measurement and assessment methods	3.03	1.08
2. Developing appropriate measurement and assessment methods	2.10	1.08
3. Managing, scoring and interpreting measurement and assessment results	2.62	1.20
4. Using measurement and assessment results while making decisions about students, education planning, curriculum development and school development.	1.76	1.02
5. Developing a valid grading system (rubric) to be used to evaluate students	1.39	1.44
6. Communicating measurement and assessment results to others	2.04	1.11
Total	12.94	3.66

* The highest score is 5 and the lowest score is 0 for each standard.

Assessment literacy inventory was applied to 189 secondary school teachers to determine teachers' measurement and assessment literacy levels. Secondary school teachers correctly answered approximately 13 (43%) out of 30 questions in the inventory. According to this finding, it can be suggested that measurement and assessment literacy levels of teachers are quite low. Considering the performances of the secondary school teachers by the assessment competence standards, it was found that the standard at which the teachers were the best was 'choosing assessment methods appropriate for instructional decisions' ($\bar{X} = 3.03$), while the standard at which they were the worst was 'developing valid grading procedures (rubric) which use student assessments' ($\bar{X} = 1.39$). According to the results of the inventory applied to the secondary school teachers in the study group, the teachers correctly answered approximately 13 of the 30 questions on average, or 43%, on average.

Results on the second sub-problem

Examination of the relationship between measurement and assessment literacy level and professional seniority. One-way ANOVA (Variance Analysis) was applied to analyze whether there is a significant difference between secondary education teachers' measurement and assessment literacy levels and the professional seniority variable. The results are presented in Table 5.

Table 5. ANOVA Results by the Professional Seniority Variable of Measurement and assessment Literacy Levels of Secondary School Teachers

Source of Variance	Total Sum of Squares	sd	Average of Squares	F	p	Significant Difference	(η^2)
Inter-group	171.85	2	85.93	6.79	0.01	0-4 and above 10 5-9 and above 10	0.07
Intra-groups	2352.51	186	12.65				
Total	2524.36	188					

According to the results of the analysis, a statistically significant difference was found between teachers' measurement and assessment and literacy level and their professional seniority ($F_{(2,186)} = 6.79$; $p < 0.05$). Measurement and assessment literacy levels of teachers vary significantly depending on professional seniority. The effect size was calculated as eta-square (η^2) = 0.07. The effect size was calculated as eta-square (η^2) = 0.07. η^2 is interpreted as the proportion of variance of the dependent variable that is related to the factor. η^2 of .01, .06, and .14 are, by convention, interpreted as small, medium, and large effect sizes, respectively (Green and Salkind, 2005). Accordingly, it can be suggested that the professional seniority variable has a moderate effect on measurement and assessment literacy. At the same time, it can be said that only 7% of the variance observed in the scores obtained from the assessment literacy inventory depends on professional seniority. As can be seen in the table, there is a statistically significant difference between the teacher who has worked for at least 10 years ($\bar{X}=11.10$) and others who worked for 4 years ($\bar{X}=13.89$) and 5-9 years ($\bar{X}=12.95$). This difference is against teachers who have worked for at least 10 years. Based on this result, it can be said that teachers who have worked for at least 10 years have lower measurement and assessment literacy levels than those who have worked for less than 10 years.

Investigation of the relationship between measurement and assessment literacy level and branch. Table 6 presents the results of one-way ANOVA conducted to determine whether there is a significant difference between the measurement and assessment literacy levels of secondary school teachers and the branch variable.

Table 6. ANOVA Results of Secondary School Teachers' Measurement and assessment Literacy Levels by the Branch Variable

Source of Variance	Total Sum of Squares	sd	Average of Squares	F	p	Significant Difference	(η^2)
Inter-group	171.55	6	28.59	2.21	0.04*	Math. - Other	0.07
Intra-groups	2352.81	182	12.93			E. of Religion – Math. E. of Religion - Physical Sci.	
Total	2524.36	188				E. of Religion - English L.	

* p < 0.05

According to the results of the analysis, a statistically significant difference was found between teachers' measurement and assessment literacy level and branch ($F_{(6,182)} = 2.21$; $p < 0.05$). This result shows that the branch variable has a moderate effect on measurement and assessment literacy. At the same time, it can be said that only 7% of the variance observed in the scores of the assessment literacy inventory depends on the branch.

As presented in the table, there is a significant difference between mathematics teachers ($\bar{X}=13.85$) and others ($\bar{X}=11.90$) (visual arts, technology design, music, information technologies, guidance counselor) and education of religion teachers ($\bar{X}=10.78$) in favor of mathematics teachers. Accordingly, it can be suggested that mathematics teachers' measurement and assessment literacy levels are higher than others and education of religion teachers. There is a significant difference between measurement and assessment literacy levels of physical sciences ($\bar{X}=13.55$) and education of religion teachers ($\bar{X}=10.78$) in favor of physical sciences teachers. Similarly, there is a significant difference between English language teachers ($\bar{X}=13.54$) and education of religion teachers ($\bar{X}=10.78$) in favor of English language teachers.

Results on the Third Sub-Problem

For the third sub-problem, the relationship between secondary school mathematics teachers' measurement and assessment literacy levels and their skill to examine items appropriate to attainment and grade level was analyzed.

Item examination skill test was applied to 54 secondary school mathematics teachers. In the assessment literacy inventory, approximately 14 of 30 questions (46% of the questions in the inventory) were answered correctly by these participants. These teachers have the highest mean ($\bar{X}=13.85$) among teachers in other branches in the assessment literacy inventory. For the item examination skill test these participants correctly answered around 14 questions out of 21 questions in the item examination skill test, in other words, participants answered 64% of the questions correctly.

Since the literacy level and item examination skill are continuous variables and they are distributed normally together, the Pearson moments product correlation coefficient was calculated to determine the direction and amount of the relationship between the variables. The analysis results are presented in Table 7.

Table 7. Correlation between Measurement and Assessment Literacy Level and Item Analysis Skill

Variable	N	r	p
Literacy Level – Item examination Skill	54	0.40	0.00*

* p < 0.05

As presented in Table 7, a statistically positive and moderately significant relationship was found between the variables obtained from the assessment literacy inventory ($r = 0.40$; $p < 0.05$). Accordingly, as the literacy level of the teachers increases, the item examination skill also increases. When the determination coefficient (square of the correlation coefficient) ($r^2 = 0.16$) is examined, it can be said that 16% of the total variance at the literacy level is caused by the item examination skill.

Table 8. Correlation Between Item Examination Skill and Teacher Competency Standards

Variable	N	r	p
Standard 1 - Item Examination Skill	54	0.34	0.01*

Standard 2 - Item Examination Skill	54	0.23	0.10
Standard 3 - Item Examination Skill	54	0.21	0.13
Standard 4 - Item Examination Skill	54	-0.02	0.89
Standard 5 - Item Examination Skill	54	0.18	0.20
Standard 6 - Item Examination Skill	54	0.37	0.01*

* $p < 0.05$

In Table 8, the relationship between the item examination skill and the standards involved in the assessment literacy inventory is presented. As presented in the table, there is a significant relationship only between the first and sixth standards and the item examination skills ($p < 0.05$). There is a positive and moderately significant relationship between the ability to choose suitable assessment methods for instruction (standard 1) and the item examination skill ($r = 0.34$; $p < 0.05$). It was also found that there is a moderate positive relationship between the ability to communicate measurement and assessment results to the educators (standard 6) and the question analysis skill ($r = 0.37$; $p < 0.05$). As seen in results as the literacy level of the teachers increases, the skill to analyze questions also increases. It is possible to say the opposite.

Discussion, Conclusions and Recommendations

This study was carried out to determine the measurement and assessment literacy levels of secondary school teachers, to reveal which deficiencies they have, and to determine the relationship between the measurement and assessment literacy levels and some variables. The study also serves to reveal the ability of teachers to conduct the item examination at the required difficulty and level in line with the attainment and grade level in the curriculum.

The current study has found that secondary school teachers in the study group correctly answered approximately 13 of the 30 questions on average, or 43%, on average. Compared to other studies in the literature, measurement and assessment literacy level were similarly found to be insufficient. According to the results of the research carried out in other countries, teachers correctly answered 23 of the 35 items (66%) in the study of Plake and Impara (1993). Pre-service teachers correctly answered 21 of the 35 questions (60%) in the study of Campbell et al. (2002) and approximately 19 (54%) of 35 items in the study of Mertler (2003). In the study of Davidheiser (2013) with 180 high school teachers, the participants answered approximately 24 (68%) of 35 questions correctly. Regarding the results of the study conducted in Turkey, Gül (2011) determined the measurement and assessment level of 180 pre-service teachers who correctly answered approximately 18 (50%) of 35 questions. In another study carried out by Karaman and Şahin (2014), it was reported that fourth-grade pre-service teachers correctly answered approximately 16 (51%) of 30 questions. In a similar study, Azrak (2017) revealed that social studies pre-service teachers correctly answered approximately 10 questions (33%) of 30 questions. The aforementioned studies indicate that secondary school teachers' measurement and assessment literacy levels are low.

Additionally, in this current study measurement and assessment literacy levels of secondary school teachers were examined according to each competence area in the inventory. The most competent area (standard) in which the teachers performed the highest was found to be choosing appropriate measurement and assessment methods ($\bar{X} = 3.03$), and the least competent area was found as developing a valid grading system ($\bar{X} = 1.39$) which use student assessments. Campbell et al. (2002), Mertler (2003) (for pre-service teachers), Gül (2011), and Karaman and Şahin (2014) also found the competence area to select appropriate measurement and assessment methods as the most highest-performance area. Plake and Impara (1993) and Mertler (2003) (for teachers) found that the highest-performance competence area was found as managing, scoring, and interpreting measurement and assessment results. Consistent with the results of Mertler (2003) (for teachers) and Karaman and Şahin (2014), the lowest-performing competence area is choosing a valid pupil grading system to be used in the assessment of students in the present study. The competence area for communicating measurement and assessment results is the lowest-performing competence area in the studies of Plake and Impara (1993), Campbell et al. (2002), Mertler (2003) (for pre-service teachers) and Gül (2011). In the studies carried out by Gelbal and Kelecioğlu (2007) and Erdoğan and Kurt (2012), teachers have been reported to be insufficient in the field of measurement and assessment, and more education is needed.

The current study has determined that there is a significant difference between the professional seniority of secondary school teachers and the level of measurement and assessment literacy. As the professional seniority of the teachers increased, the level of measurement and assessment literacy decreased. Accordingly, it can be said that the professional seniority variable has a moderate effect on measurement and assessment literacy. According to this study, it can be said that teachers who have worked for at least 10 years

have lower measurement and assessment literacy levels than those who have worked for less than 10 years. This particular finding was not compatible with other studies. Erdost (2018) detected a linear relationship between experience and measurement and assessment literacy level. Likewise, in the study of Plake and Impara (1993), it was found that experienced teachers' measurement and assessment literacy levels were higher than those of less experienced teachers. This finding may result from regional differences, interpersonal differences, attitudes towards measurement and assessment.

Another finding of the study is that the branch variable has a moderate effect on measurement and assessment literacy. A statistically significant difference was found between the branch of secondary school teachers and their level of measurement and assessment. There is a significant difference between mathematics teachers and others (visual arts, technology design, music, physical education, information technologies, guidance counselor) and education of religion teachers in favor of mathematics teachers. Accordingly, it can be suggested that mathematics teachers' measurement and assessment literacy levels are higher than others and education of religion teachers. It is also found that there is a significant difference between measurement and assessment literacy levels of physical sciences and education of religion teachers in favor of physical sciences teachers. Similarly, there is a significant difference between English language teachers and the education of religion teachers in favor of English language teachers. In the literature, Karaman and Şahin (2014) found a significant difference between the branch and measurement and assessment literacy levels. This finding is compatible with the study.

Lastly, the current study has determined that secondary school mathematics teachers answered correctly around 14 questions on average out of 28 questions in the item examination skill test, that is, the participants answered 64% of the questions correctly. In the assessment literacy inventory, this sample group answered correctly around 14 questions out of 30 questions, in short, the participants answered 46% of the questions in the inventory correctly. A statistically positive and moderately significant relationship was found between the measurement and assessment literacy level of secondary school mathematics teachers and the skill to examine items in the desired way in terms of the level of attainment and grade level. Accordingly, as the literacy level of the teachers increases, the skill to analyze questions also increases. It is possible to say the opposite.

Although this study has important findings, it has some limitations: the data of this study, for instance, were obtained from secondary school teachers. Further studies can be conducted with teachers from different levels of education such as primary school, secondary school, and high school, and it can be investigated whether there is a significant difference between the education level that the teacher is at service and the measurement and assessment literacy. Also, the "Item Examination Skill Test" prepared by the researchers can be prepared and developed not only for the mathematics lesson but also for other lessons and the difference can be calculated according to the branch. Also, due to the low measurement and assessment literacy level of secondary school teachers, studies such as seminars or training on this subject can be conducted. Practical activities can also be conducted along with the theoretical information on the subject.

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