How valid and reliable are teachers' assessments of gifted students?

Sümeyye Arkan [ID][1*], **Sema Tan** [ID][2]

[1]Zonguldak Bülent Ecevit University, Eregli Faculty of Education, Department of Special Education, Türkiye
[2]Sinop University, Faculty of Education, Department of Special Education, Türkiye

Abstract: Teachers' perceptions, attitudes, and opinions about students, curricula, or evaluation methods contribute to the development of students' talents. Thus, researchers often collect data from teachers to identify gifted students, determine educational practices to meet the students' needs and assess gifted education programs. Researchers often develop measurement tools or utilize existing ones to collect valid and reliable data from teachers. This systematic literature review screened online databases to investigate measurement tools for teachers developed from 2017 to 2024. We combined the keywords "scale", "instrument", "questionnaire", "inventory", "gifted," and "teacher" to screen Web of Science (WoS) and Scopus databases. We categorized the measurement tools based on their intended use and analyzed seventeen instruments across themes including identification/nomination, attitude-behavior-perception, and knowledge and opinion. Nearly half of these studies employed exploratory or confirmatory factor analysis for construct validity, although some relied on the more superficial face validity. Overall, the studies demonstrated high reliability and validity, but simple analyses should be repeated to further enhance the robustness of measurement instruments.

1. INTRODUCTION

Assessment is considered one of the basic building blocks used in special education to collect information from students (Lockwood *et al.*, 2021). Therefore, researchers develop and use measurement tools to identify students' educational needs and psychomotor characteristics and assess and explore their many characteristics (Maison *et al.*, 2020). In order to achieve this purpose, researchers develop scales, inventories, and questionnaires according to the field of study and research topic. Developing a measurement tool to measure a particular construct correctly takes a long time. Therefore, they sometimes use existing valid and reliable measurement tools (Güngör, 2016). According to Karakoç and Dönmez (2014), researchers interested in obtaining a valid and reliable measurement tool should study and interpret an existing or developed scale according to many criteria and standards. Furthermore, the American Psychological Association (APA, 2014) has published standards for scales developed

*CONTACT: Sümeyye ARKAN ✉ sumeyyearkan97@gmail.com ⌨ Zonguldak Bülent Ecevit University, Eregli Faculty of Education, Department of Special Education, Türkiye

in education and psychology. In addition, the APA 7 publication guidelines include content on reporting validity and reliability for qualitative and quantitative research (APA, 2020).

Researchers have developed and continue to refine intelligence tests, creativity scales, teacher evaluation instruments, and psychometric assessments to gauge the achievements of gifted students (Acar *et al.*, 2016; Kaufman *et al.*, 2011; Peters & Gentry, 2010; Renzulli *et al.*, 2021; Sak *et al.*, 2016). Research pertaining to the development of measurement tools in gifted education is predominantly categorized under the subfield of identification, given that student identification remains one of the most extensively studied areas in this domain (Dai *et al.*, 2011). In order to gather information about students, researchers employ various measurement tools, including self-report instruments (Şencan, 2003) and criterion-referenced assessments (Renzulli, 2011). Moreover, researchers frequently engage teachers in the nomination process, as teachers offer vital, albeit potentially biased, insights into student performance and the effectiveness of teaching and evaluation processes (Siegle *et al.*, 2011). Consequently, researchers focusing on teaching (Nel *et al.*, 2011; Österling & Christiansen, 2022) and gifted education (Bildiren & Kargın, 2019; Idsøe *et al.*, 2022; McCoach & Siegle, 2007; Park *et al.*, 2016) routinely consider and assess teachers' opinions, attitudes, and competencies.

Numerous assessment tools have been developed for teachers including specialized instruments for teachers working with gifted students. A few researchers have systematically examined the assessment instruments developed for gifted students. Jarosewich *et al.* (2002) examined three assessment scales: Gifted and Talented Evaluation Scales (Gilliam *et al.*, 1996); Gifted Evaluation Scale (McCarney & Anderson, 1989); and Scales for Rating the Behavioral Characteristics of Superior Students (Renzulli *et al.*, 1976; Renzulli *et al.*, 1997). They examined them in detail regarding subscales, age range, duration, and validity and reliability analysis. They found that within the nomination scales, students could be screened based on federal definition which includes and relates to giftedness, leadership, artistic talent, or creativity. In addition, the internal consistency and test-retest reliability of these scales were generally adequate, but the inter-rater reliability of scales is not adequately reported. Also, the researchers concluded that validity of scales (content and construct) was limited. Cao *et al.* (2017) conducted a literature review on assessing gifted students between 2005 and 2016. They categorized the types of assessments used in the research published between these years. They concluded that there had been advances in assessment over the years, and several assessment tools have been developed. Farah and Chandler (2018) examined eight measurement tools used for observation. They conducted a detailed review of the instrument's purpose, validity and reliability analysis, and development process. They underlined the need of a new instrument for observation. Pfeiffer and Jarosewich (2007) looked at giftedness multidimensionally and analyzed a teacher rating scale already developed for identification (The Gifted Rating Scales-School; GRS-S). They concluded that it was a valid screening scale, and that this analysis could provide additional support for the test manual. These instruments, in conjunction with other measurement tools such as tests and surveys, provide a framework for the collection of quantitative data in the field of educational research.

Researchers employ various measurement tools to gather quantitative data, which can be categorized into tests, surveys, and scales within the framework of measurement tools (Terzi, 2020). Surveys serve as effective research methods for comparing participants' knowledge, attitudes, beliefs, and behaviors (Woodcock, 2011), while scales are commonly utilized to measure abstract concepts like attitudes. Likert-type scales are generally developed to explore latent variables such as attitudes, fears, and perceptions (Terzi, 2020). Although surveys and scales are often used interchangeably, surveys offer the advantage of studying interrelationships among multiple topics. Many surveys integrate one or more scales as separate sections, which are then analyzed together or separately.

Tests, on the other hand, are typically designed to assess knowledge or skill (Trochim *et al.*, 2016), emphasizing the importance of field-specific evaluation of these instruments. While researchers have systematically reviewed measurement instruments used in gifted identification and classroom observation (Cao *et al.,* 2017; Jarosewich *et al.*, 2002), there remains a gap in the literature regarding systematic reviews of tools developed to examine and assess teachers' views, attitudes, or competencies.

Researchers have employed various methods to explore a range of measurement tools and select the most appropriate ones for data collection. One such method is the systematic review, defined as a scientific process guided by precise and rigorous guidelines to ensure comprehensiveness, impartiality, accountability, and transparency in both methodology and execution (Dixon-Woods, 2016). Rammsted and Matthias (2019) argue that systematic literature reviews and meta-analyses should evaluate quality indicators, such as objectivity, reliability estimates, construct validity, factorial validity, and predictive validity of measurement instruments.

One advantage of systematic reviews is their ability to identify the strengths and weaknesses within the literature on a particular topic (Cook & West, 2012). While previous systematic reviews have examined measurement instruments for gifted identification and classroom observation (Cao *et al.*, 2017; Jarosewich *et al.*, 2002), a gap remains in the literature regarding reviews of tools designed to assess teachers' views, attitudes, or competencies.

To address this, we conducted a systematic review of teacher-focused instruments for assessing gifted students. The rationale for including publications from 2017 to 2024 is that Cao *et al.* (2017) conducted an analysis of publications up to 2016. Our goal was to document the validity and reliability of teachers' assessments when evaluating gifted students and to provide a roadmap for researchers interested in evaluating teachers' opinions, attitudes, or competencies. By examining the measures identified in this review, researchers can adapt the tools to suit their needs and gain insights into the subject areas most commonly involving teachers.

In this context, the following research questions guided our systematic literature review:

Research Question 1: What measurement tools, such as scales, instruments, questionnaires, and inventories, were developed between 2017 and 2024 for assessing gifted students, specifically designed for use or engagement by teachers?

Research Question 2: What validity and reliability criteria do researchers report when they develop a new measurement tool intended for use or engagement by teachers in assessing gifted students?

2. METHOD

We conducted a systematic literature review to examine the measurement tools developed for teachers in the gifted literature. The systematic literature review was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, 2021). We conducted a literature search in Web of Science and Scopus, databases between November-December 2022, January 2023 and March 2024 based on the keywords "scale," "instrument," "questionnaire," "inventory," "gifted," "teacher". The literature review yielded 921 publications.

We set inclusion and exclusion criteria to examine the publications in detail. The inclusion criteria were as follows: a) having been published between 2017 and 2024, b) written in Turkish or English, c) full text available, d) published in a peer-reviewed journal, d) a measurement tool developed for teachers, and e) validity and reliability research. The exclusion criteria were as follows: a) publications published before 2017, b) not in the field of giftedness, c) systematic review, meta-analysis, book chapter, and paper. Figure 1 shows the PRISMA diagram for the screening according to the criteria.

Furthermore, this systematic literature review did not include intelligence tests and nomination scales for three reasons. First, researchers have conducted test reviews. Second, the instructions and contents of intelligence tests are usually published in book form. Third, several other researchers have previously conducted systematic literature reviews to evaluate nomination scales (Jarosewich *et al.*, 2002; Pfeiffer & Jarosewich, 2007). Therefore, we only included nomination instruments developed for teachers (Alnaim, 2023; Bildiren & Kargın, 2019; Idsøe *et al.*, 2022).

Figure 1. *PRISMA diagram.*
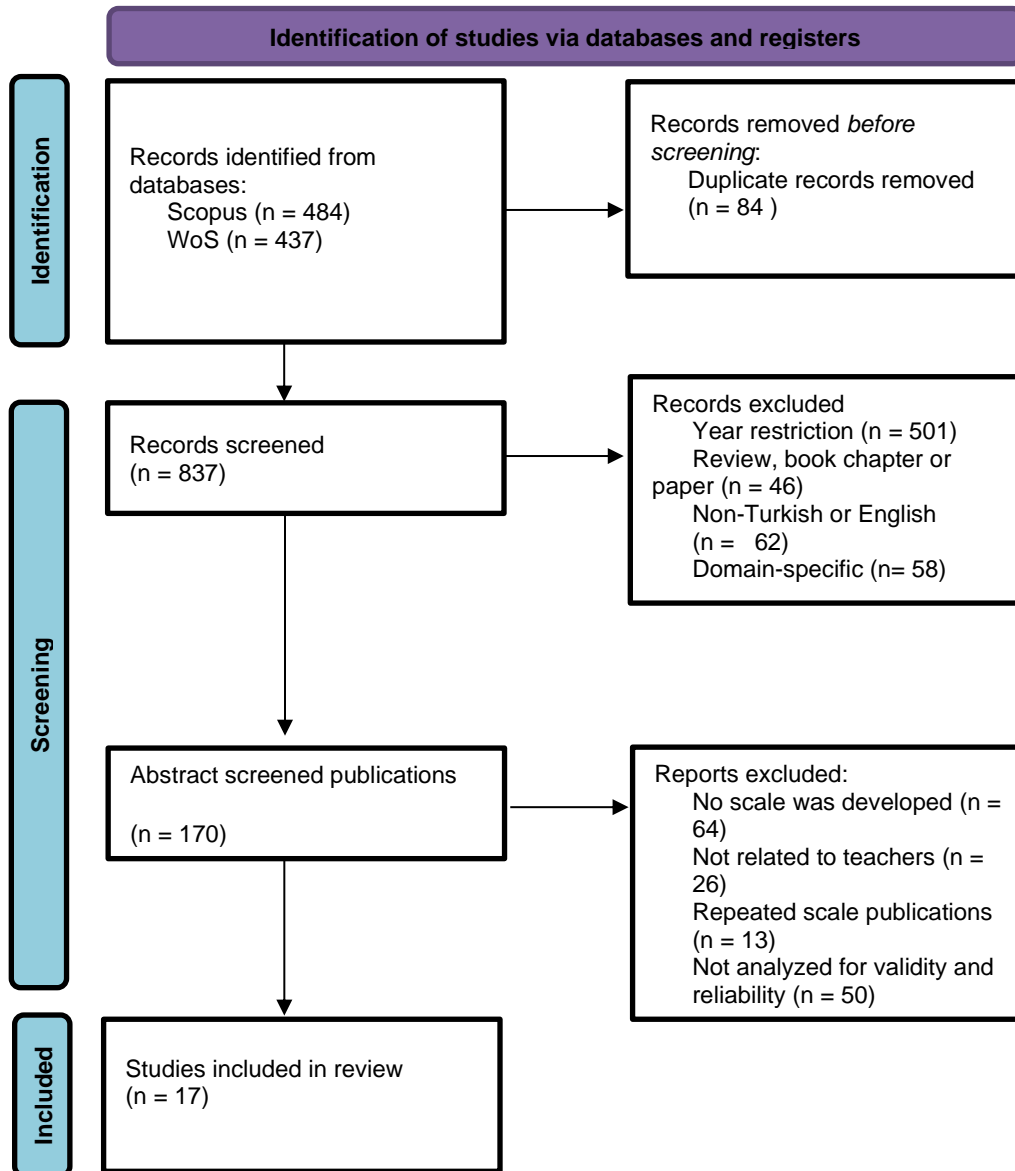
2.1. Data Collection

Seventeen publications were recruited according to the inclusion and exclusion criteria. In the coding procedure, we used inclusion and exclusion criteria to select a publication that is appropriate for our research aim and questions. We examined and included the publications according to whether they were published in gifted education literature, whether the measurement tool was developed, and reported validity and reliability criteria. We identified 921 publications in our initial database search. First, duplications were removed, reducing the number of publications to 837. Second, the remaining publications were restricted to Turkish and English languages, and keywords were checked in the titles and abstracts. The publications

that were unsuitable for the review were removed, reducing the number of publications to 170. Third, the abstracts and method sections of the remaining publications were examined in detail. The publications that did not employ a measurement tool, did not have a full text, and did not have a measurement tool for teachers were removed. We checked whether the publications that developed measurement tools conducted validity and reliability analyses according to the criteria in Table 1. Self-report instruments are generally reflective scales. In this context, studies reporting at least one of the validity and reliability analysis criteria needed for reflective scales were included in the sample.

Table 1. *Validity and reliability criteria (Şencan, 2003).*

Validity	Reliability
Face	Split-half
Content	Item total score correlation
Nomological network	Cronbach Alpha coefficient
Concurrence	Parallel form
Predictive validity	Test-retest
Factor analysis within the framework of construct validity	Exploratory common factor analysis
Merger-separation	
Multiple feature multiple methods	

2.2. Data Analysis

We analyzed the publications descriptively with the aim of providing readers with a comprehensive source of information on the measurement tools, including their strengths and limitations, to help them make informed decisions when selecting a tool that is appropriate for their specific needs and context. For this reason, after determining what the measurement tools we examined were used for, we analyzed these measurement tools thematically according to their intended use. Therefore, the sample consisted of 17 publications (see Table 2). Although there are many types of measurement tools, we only included 17 publications because one of our objectives was to reveal the validity and reliability of the measurement tools. This is because researchers do not conduct validity and reliability analyses for inventories, questionnaires, and instruments. In the findings section, we reported the measurement tools, their purpose, sample, and validity and reliability analyses in more detail.

Table 2. *Reviewed publications.*

N	Publication	Measurement Tool	Classification	Purpose of Use	Sample	Validity	Reliability
1	Alnaim (2023)	Special Questionnaire	Survey	Identification/Nomination	108 teachers of gifted students	Face validity was reported.	Internal reliability (Cronbach's alpha)
2	Cheung *et al*. (2022)	Teacher Behavior Scale (TBS) Teacher Attitude Scale (TAS) Teacher Knowledge Scale (TKS)	Scale	Behavior Attitude Knowledge	2031 teachers (not specified)	EFA/CFA and factor loadings were reported for the developed scales. Same datasets were used for factor analysis.	KR-20 was reported.
3	Szymanski *et al*. (2022)	Determining Attitudes Toward Ability (DATA)	Scale	Attitude	350 teachers (not specified)	Construct validity was reported	Internal reliability (Cronbach's alpha)
4	Goddard & Evans (2018)	Teacher Attitudes	Survey	Attitude	50 elementary school teachers	Face validity was reported.	Internal reliability (Cronbach's alpha)
5	Idsoe *et al*. (2022)	Teacher Nomination Scale Parent Nomination Scale	Scale	Identification/Nomination	Parents and teachers of 243 students	PCA, CFA and concurrence validity were reported. Different datasets were used for factor analyses.	Inter-item correlation was calculated.
6	Al-Mamari *et al*. (2020)	Self-Awareness Scale (SAS)	Scale	Belief	60 teachers of students with LD	Face validity was reported.	Internal reliability (Cronbach's alpha)
7	Kandemir *et al*. (2019)	Creative Teaching in Mathematics Class scale	Scale	Behavior	423 math teachers	EFA/CFA, convergent and discriminant validity were reported. Different datasets were used for factor analyses.	Internal reliability (Cronbach's alpha)
8	Bildiren & Kırgın (2019)	Nomination Form	Survey	Identification/Nomination	Pre-school teachers	Face validity and factor loadings were reported.	KR-20 was reported.
9	Alshammari & Rababah (2019)	Scale for Teachers to Identify Gifted Students with Learning Disabilities in the Primary Stage	Scale	Identification/Nomination	Developed for elementary school teachers	Content, concurrence, factor, construct, and discriminatory validity were reported. Same datasets were used for factor analyses.	Test-retest Cronbach Alfa
10	Jarrah & Almarashdi (2019)	Teachers' perceptions toward their competency to teach gifted and talented students	Scale	Perception	66 math teachers	Face and content validity were reported.	Internal reliability (Cronbach's alpha)
11	Dağlıoğlu *et al*. (2019)	Classroom Practices in Inclusive Preschool Education	Scale	Belief	156 pre-school teachers	EFA and CFA were reported. Same datasets were used for factor analyses.	Internal reliability (Cronbach's alpha)

	Environment with Talented and Gifted Children Scale					
12 Gonzalez & Jung (2021)	Survey	Survey	Attitude	252 elementary school teachers	Construct validity and factor loadings were reported.	Internal reliability (Cronbach's alpha)
13 Westphal et al. (2017)	Perceived Knowledge About Grade Skipping		Belief			Internal reliability (Cronbach's alpha)
	Acceptance of Grade Skipping	Survey	Attitude	316 teachers (not specified)	Content and factor validity were reported.	Internal reliability (Cronbach's alpha)
	Beliefs About Students Development After Skipping a Grade		Belief			
14 Dersch et al. (2022)	The Math-Gender Misconception Questionnaire	Survey	Knowledge	303 teachers (different spezialization)	Construct validity and factor structure were reported.	McDonald's omega was reported.
15 Aljughaiman et al. (2017)	The Profile of Gifted Students	Instrument	Identification/No mination	195 gifted student teachers and elementary school teachers	Content validity was reported.	Test-retest was applied.
16 Weyns et al. (2021)	Likability Emotional Demand Questionnaire	Scale Questionnaire	Belief Belief	522 teachers in training	Item loadings and PCA were reported. .	Internal reliability (Cronbach's alpha)
17 Wadaani (2023)	Math Teachers' Attitudes Toward Nurturing Creativity	Scale	Attitude	93 math teachers	Content validity was reported.	Internal reliability (Cronbach's alpha)

Note. EFA=Expolary Factor Analyses, CFA=Confirmatory Factor Analyses, PCA=Principal Component Analyses, KR-20=Kuder-Richardson 20.

3. RESULTS

The publications were analyzed according to the intended use of the measurement tools. Table 3 presents the themes developed from these analyses. Some researchers created more than one measurement tool. In total, eighteen tools were grouped under six distinct themes.

Table 3. *Themes created according to purposes of using measurement tools.*

Theme	Measurement Tools
Identification/Nomination	Special Questionnaire (Alnaim, 2022)
	Teacher Nomination Scale (Idsoe *et al*., 2022)
	Nomination Form (Bildiren & Kargın, 2019)
	Scale for Teachers to Identify Gifted Students with Learning Disabilities in the Primary Stage (Alshammari & Rababah, 2019)
	The Profile of Gifted Students (Aljughaiman *et al*., 2017)
Behavior	Teacher Behavior Scale (TBS) (Cheung *et al*., 2022)
	Creative Teaching in Mathematics Class (Kandemir *et al*., 2019)
Attitude	Acceptance of Grade Skipping (Westphal *et al*., 2017)
	Teacher Attitude Scale (TAS) (Cheung *et al*., 2022)
	Determining Attitudes Toward Ability (DATA) (Szymanski *et al*., 2022)
	Teacher Attitudes (Goddard & Evans, 2018)
	Survey (Gonzalez & Jung, 2021)
	Math Teachers' Attitudes Toward Nurturing Creativity (Wadaani, 2023)
Perception	Teachers' perceptions toward their competency to teach gifted and talented students (Jarrah & Almarashdi, 2019)
	Perceived Knowledge About Grade Skipping (Westphal *et al*., 2017)
Knowledge	Teacher Knowledge Scale (TKS) (Cheung *et al*., 2022)
	The Math-Gender Misconception Questionnaire (Dersch *et al*., 2022)
Belief	Beliefs About Students Development After Skipping a Grade (Westphal *et al*., 2017)
	Classroom Practices in Inclusive Preschool Education Environment with Talented and Gifted Children Scale (Dağlıoğlu *et al*., 2019)
	Likability and Emotional Demand Questionnaire (Weyns *et al*., 2021)
	Self-Awareness Scale (SAS) (Al-Mamari *et al*., 2020)

The studies reviewed span several countries, with a notable frequency in research from Saudi Arabia (Aljughaiman *et al*., 2017; Alnaim, 2022; Alshammari & Rababh, 2022; Jarrah, 2022), followed by Turkiye (Bildiren & Kargın, 2022; Dağlıoğlu, 2022; Kandemir *et al*., 2019), and Germany (Dersch, 2022; Westphal *et al*., 2022; Weyns *et al*., 2022). Other countries represented include China (Cheung *et al*., 2022), the USA (Szymanski, 2022; Wadaani, 2022), Australia (Goddard & Evans, 2022), Norway (Idsøe *et al*., 2022), Oman (Al Mamari, 2022), and Mexico (González Jung, 2022). Teacher specializations include mathematics teachers (Jarrah, 2022; Kandemir *et al*., 2019; Wadaani, 2022), primary school teachers (Goddard & Evans, 2022; González Jung, 2022), and preschool teachers (Bildiren & Kargın, 2022; Dağlıoğlu, 2022). There is also research on teachers of gifted students and students with learning disabilities (Alnaim, 2022; Al Mamari, 2022; Aljughaiman *et al*., 2017). Several studies did not specify the type of teachers involved (Alshammari & Rababh, 2022; Idsøe *et al*., 2022; Szymanski, 2022; Westphal *et al*., 2022).

3.1. Identification/Nomination

Assessment is critical to meeting the educational needs of gifted students. Researchers often focus on this topic and use different assessment tools to evaluate gifted students. This theme documented and analyzed assessment tools developed for the purpose of identification/nomination, intended for use by teachers to help identify students for further evaluation.

Researchers developed the Special Questionnaire (Alnaim, 2022) and the Scale for Teachers to Identify Gifted Students with Learning Disabilities (Alshammari & Rababah, 2019) for teachers to use to nominate students. The items in the Scale for Teachers to Identify Gifted Students with Learning Disabilities were based on the Al-Hajri (2015) scale, which was developed to determine giftedness/learning disability and the characteristics of gifted students with learning disabilities in the literature (Alshammari & Rababah, 2019). The Special Questionnaire (Alnaim, 2022) items, on the other hand, were created based on qualitative data collected through interviews with teachers about the challenges faced by gifted people with ADHD and the relevant educational literature. Alnaim (2022) also established content validity and calculated Cronbach's alpha coefficient for reliability (.761-.926) for the Special Questionnaire. Bildiren and Kargın (2019) developed and used the Nomination Form to enable teachers to guide students in a program. In the process of developing the form, a comprehensive review of the pertinent national and international literature was undertaken by the researchers to inform the selection of the items. Following this, the form was subjected to a rigorous assessment by a panel of experts to gauge its content validity and ensure its adequacy for the intended purpose. The last form consists of 14 items and two subscales. The researchers reported factor loadings and assessed internal consistency for reliability (KR-20=.92).

Idsoe *et al.* (2022) aimed to nominate students for a project. To do this, they developed and analyzed the Teacher Nomination Scale and the Parent Nomination Scale. The instrument has seven items that are rated on a four-point Likert-type scale. Firstly, researchers reviewed the existing scales in the literature and after that, they examined the characteristics identified by professionals in the field to decide on the scale items. They modified these scales according to the local screening instruments for parents and teachers because the Norwegian Early Childhood Education and Care (ECEC) system does not include cognitive tasks that could reveal high intellectual abilities among these children. The items on this scale correlate more than those developed for parents. They included these correlations under the heading of concurrent validity. They used confirmatory factor analysis to explain the items' mean and standard deviation scores. The scale developed for teachers is more consistent for screening purposes.

Aljughaiman *et al.* (2017) developed gifted student profiles and then presented them to teachers. They ask teachers to nominate the eight profiles which constitute of giftedness behavior. Their aim was revealing which student was suitable for the identification. For the content validity they presented the cases to the seven professors from giftedness and creativity domain. For the reliability of the cases, they used test-retest reliability coefficient (.81). Teachers' nominations of students were biased towards students who achieved high grades, while students who achieved low grades were disregarded.

Based on scales and questionnaires in the identification/nomination theme, researchers have developed valid and reliable tools for teachers. Since these tools have demonstrated both reliability and validity, it can be concluded that they are practical and suitable for use in the identification/nomination process.

3.2. Attitude-Behavior-Perception

The scales developed by the studies included in our sample are Likert-type scales. Cheung *et al.* (2022) developed the Teacher Attitude Scale (TAS) to obtain teachers' views on gifted students. The scale consists of 12 items and three subscales: teacher support, attitude toward

gifted education, and support for gifted education. All but one of the items were normally distributed. Therefore, the researchers conducted an exploratory factor analysis on 17 items. They removed five items from the scale because they had low factor loadings.

Cheung *et al*. (2022) developed the Teacher Behavior Scale (TBS) to assess teachers' instructional practices in three dimensions: nurturing gifted students, differentiated instruction, and learning support for undiagnosed students. This scale also has 12 items loaded on three dimensions. The researchers conducted exploratory and confirmatory factor analyses. They reported factor loadings for the items in the subscales. For reliability, they calculated pretest and posttest Cronbach's alpha values for each subscale (.84-.71, .75, .85, .78-.79).

Jarrah and Almarashdi (2019) developed a measurement tool for perception measurement due to reviewing the literature on giftedness. They conducted pilot studies and used the scales to measure teachers' teaching-related competencies. In their survey, the researchers used 19 statements. For content validity, they sent the scale to six faculty members specializing in gifted education and math education. Additionally, the scale was reviewed by eight specialists, including mathematics teachers and supervisors, for feedback and comments. The scale measured teachers' perceptions using two subscales: (1) the Competency to Teach Gifted and Talented Students scale (nine items) and (2) the Teaching Gifted and Talented Students scale (ten items). They reported Cronbach's alpha coefficient (.93), which indicated that the scales were highly reliable.

Westphal *et al*. (2017) used and developed several scales for grade-skipping among gifted students. They developed four scales. The items in the scales were drawn from the authors' experiences in teacher training for gifted education, as well as from the relevant research literature. Subsequently, researchers evaluated the items for content validity, specifically focusing on their clarity, comprehensibility, and whether they accurately reflected the intended construct. They presented them online to teachers to collect data. They used the Perceived Knowledge About Grade Skipping scale to assess teachers' perceptions of students' grade skipping. They reported internal consistency for reliability (Cronbach's alpha .86). For validity, they conducted an exploratory factor analysis on four items and removed one item from the scale. After examining teachers' attitudes toward gifted education, they developed the Acceptance of Grade Skipping scale because they needed another scale for the study. The four-item response scale measures teachers' attitudes toward grade-skipping for gifted students. For validity, they conducted an exploratory factor analysis. For reliability, they calculated internal consistency (Cronbach's alpha .89).

Szymanski *et al*. (2022) developed the Determining Attitudes Toward Ability (DATA) scale to measure teachers' attitudes toward various issues related to gifted education because no questionnaire provided a wide range of information about gifted students. The scale measures attitudes toward grade skipping, acceleration, diagnosis, and curriculum. The scales developed and used after the scale developed by Gagné and Nadeau (1991) were examined, and the items were decided accordingly. The DATA scale consists of 92 items rated on a four-point Likert scale. For content validity, the scale was reviewed by four domain experts and then teachers. The researchers conducted a pilot study for the DATA scale and administered it to 124 participants. They removed 18 items. The final version of the scale consists of five subscales and 74 items. The final version included both exploratory and confirmatory factor analyses. However, the researchers did not recommend the scale for use due to the low sample size and some low factor loadings.

Goddards and Evans (2018) developed the Teacher Attitudes questionnaire to examine pre-service teachers' attitudes toward inclusion. The questionnaire has two parts. The first part consists of questions about demographic characteristics. The second part consists of three sub-dimensions to determine pre-service teachers' attitudes. According to the pilot study results, the questionnaire's final version consists of 40 items rated on a five-point Likert-type scale. They

reported face validity for validity and internal consistency for reliability (Cronbach's alpha .761).

Gonzalez and Jung (2021) detected that we needed a questionnaire to determine teachers' attitudes toward acceleration. Therefore, they developed an 80-item questionnaire to assess attitudes toward acceleration and its predictors. They reported factor analyses for validity and reliability. They calculated Cronbach's alpha values for the subscales; support for acceleration (.64), communication with gifted students (.75), support from school administrators (.73), socio-emotional impact (.73), perception of elitism (.59), and self-perception of gifted students (.82)

Kandemir *et al*. (2019) argued that creativity is content-based, and measuring the behaviors that promote teachers' discipline-specific creativity is important. Therefore, they developed a scale with six subscales. They developed the scale for mathematics and aimed to assess teachers' behaviors. The final version of the scale consists of 31 items. The scale has high factor loadings, which indicates validity. They calculated Cronbach's alpha values of the subscales for reliability. Cronbach's alpha coefficients demonstrated the scale's reliability, with values of .91 for Teaching Style, .88 for Confidence, .91 for Classroom Climate, .74 for Overcoming Barriers, .75 for Asking Questions, and .89 for Innovative Teaching Practices.

Weyns *et al*. (2021) used two additional scales, in addition to previously developed and implemented questionnaires. One of these scales assessed likability, using a self-constructed questionnaire consisting of three items: 'I like him/her', 'I would like to spend time with him/her', and 'I would like to teach him/her'. Principal component analysis was used, and the results showed that all items had loadings above 0.40. The Likability scale's reliability was reported as 0.74 using Cronbach's alpha. Another questionnaire, the Emotional Demand, also reported a reliability of 0.75 using Cronbach's alpha. This questionnaire aimed to measure how engaged the student was and what their feelings were towards the student.

Wadaani (2023)'s questionnaire comprises sections for collecting data on preservice education and professional development independent variables, evaluating teachers' attitudes towards creativity and mathematics gifted education, and assessing the availability of support features for enhancing creativity and developing mathematical giftedness. Participants rated their level of agreement with statements using a 5-point Likert scale. The questionnaire's validity was ensured by connecting items to relevant literature and utilizing existing validated instruments. Refinement of the instrument was achieved through feedback from teachers and experts, as well as focus group discussions. The instrument's reliability was assessed using Cronbach's Alpha coefficient, resulting in a high value of 0.88 for the overall scale, indicating its reliability. Item-total statistics showed that no item significantly affected the reliability.

The measurement tools categorized under this theme were developed to address the need for new tools in the assessment of teachers' attitudes, behaviors, and perceptions towards educational programs for gifted students. The primary purpose of these tools was to evaluate the effectiveness of these programs. Factor analyses and assessments of internal consistency reliability were conducted to ensure the reliability of the items in these measurement tools.

3.3. Knowledge

In the study conducted by Cheung *et al*. (2022), multiple measurement tools were developed, and the same samples were utilized in these tools. The Teacher Knowledge Scale (TKS) is another measurement tool that was developed. Teacher Knowledge Scale (TKS) based on myths about gifted students. Teachers evaluate myths as true-false-don't know. The scale consists of 10 items. The researchers reported content validity. For reliability, they calculated the pretest and posttest KR-20 internal consistency (KR-20=0.44, 0.52).

Dersch *et al*. (2022) developed the Math-Gender Misconception Questionnaire to examine whether three potential misconceptions about giftedness are related to theoretically relevant

constructs. The questionnaire consists of 30 items rated on a five-point Likert-type scale. Fifteen items address misconceptions related to mathematics-gender, while the remaining items address misconceptions related to research hypotheses. The researchers reported McDonald's Omega for reliability. The empathizing-systemizing ($\omega = .88$) and compensating for girls ($\omega = .76$) subscales have good reliability, while the noncompensating for girls ($\omega = .72$) subscale has acceptable reliability. They conducted a factor analysis for validity and found that all three factors were consistent.

The study of myths is a common focus in the field of giftedness, with researchers attempting to assess the level of knowledge of teachers and individuals in this area (Kaya *et al.*, 2015; O'Connor, 2012; Sak, 2011). To assess teachers' comprehension of myths, Dersch *et al.* (2022) developed measurement tools that concentrate on the connection between mathematics and gender. Similarly, Cheung *et al.* (2022) created measurement tools to assess general myths in the field.

3.4. Opinion

Westphal *et al.* (2017) created another scale to assess teachers' opinions about the potential impact of grade skipping on students' development. As stated above, the scale's items were developed from the authors' experiences in teacher training for gifted education and from the existing research literature. Researchers then evaluated the items for content validity. The scale consists of 17 items rated on a four-point Likert-type scale. Westphal *et al.* (2017) performed an exploratory factor analysis to evaluate the scale's validity. For reliability, they calculated Cronbach's alpha coefficients, which were .71 for opinions and .86 for academic development.

Dağlıoğlu *et al.* (2019) developed a scale to explore the teaching approaches applied by teachers in inclusive preschool classrooms with typically developing and gifted children together. The instrument consists of 22 items rated on a five-point Likert-type scale. The confirmatory factor analysis showed that the scale agreed with the model. One of the project's aims was to identify the primary educational and instructional elements preschool teachers use in inclusive education settings. Based on this purpose, the researchers constructed items on the educational and instructional elements that preschool teachers use in inclusive education settings. For validity, they conducted an exploratory factor analysis and confirmatory factor analysis and reported factor loadings. They calculated Cronbach's alpha for reliability. The whole scale has a Cronbach's alpha of .88, while the first, second, and third subscales have Cronbach's alpha values of .76, .83, and .80, respectively.

Al-Mamari *et al.* (2020) developed the Self-Awareness Scale to assess teachers' awareness of gifted students with learning difficulties. They concluded that the scale was suitable enough to assess teachers' awareness. They reported face validity for validity and calculated Cronbach's alpha for reliability. The "knowledge awareness," "skill awareness," and "individual awareness" have Cronbach's alpha values of .94, .96, and .95, respectively.

This theme explored three measurement tools designed to evaluate and assess teachers' opinions. In the educational literature, teachers are frequently consulted for their opinions on various topics within the field. Therefore, it is crucial to be familiar with existing measurement tools to facilitate their reuse.

4. DISCUSSION and CONCLUSION

This systematic literature review examined measurement tools designed for teachers to evaluate gifted students. The sample included 17 publications featuring 13 scales, 7 questionnaires, and one other instrument. We analyzed the validity and reliability of these tools across six thematic areas. The results show that researchers have generally developed measurement tools for teachers in the theme of "attitude." Researchers have developed up-to-date, valid, and reliable scales to replace the scale previously developed by Gagne and Nadeau (1991), which provided a wide range of assessment opportunities for teachers and parents in the field of giftedness

(Jarrah & Almarashdi, 2019; Szymanski *et al.*, 2022). This scale allowed for the assessment of attitudes in gifted children across various dimensions, including needs and support, resistance to objections, social value, rejection, ability grouping, and school. Researchers have also developed measurement tools related to "identification-nomination." Researchers have developed only two measurement tools under the themes of "perception" and "behavior."

The majority of scales in our sample assess educational adaptations (*n* = 8) (Cheung *et al.*, 2022; Idsøe *et al.*, 2021; Westphal *et al.*, 2017). Given that the literature primarily focuses on identification in studies of giftedness (Dai *et al.*, 2011), one might expect researchers to concentrate on identification when developing measurement tools for teachers. However, our findings revealed that even though several measurement tools related to identification-nomination were designed for the teachers, the researchers also mainly focused on other topics such as attitudes as well.

Farah *et al.* (2018) conducted a similar systematic literature review and focused on publications that did not conduct validity and reliability analysis. The studies we reviewed, including Cheung *et al.* (2022), Alshammari and Rababah (2019), and Dağlıoğlu *et al.* (2019), used the same dataset for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Furthermore, several studies have emphasized the importance of using different datasets for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Hurley *et al.*, 1997: Knekta *et al.*, 2019). Only the studies of Idsoe *et al.* (2022) and Kandemir *et al.* (2019) in our sample conducted factor analyses using different datasets. Therefore, it is safe to say that out of the studies employing factor analysis as a method, Idsøe *et al.* (2022) and Kandemir *et al.* (2019) followed a more methodologically sound approach than the others. Currently, the most widely used index for assessing scale reliability is Cronbach's coefficient alpha (Raykov& Marcoulides, 2019). Our results showed that most publications have calculated Cronbach's alpha to report internal reliability. According to Nunnally (1978), a scale and its subscales with a Cronbach's alpha coefficient of .70 and above are reliable. In this context, most publications in our sample have reported Cronbach's alpha values above .70. Studies that did not report Cronbach's alpha were evaluated for reliability using KR-20, McDonald's omega, and test-retest methods. Almost half of the publications have conducted exploratory and confirmatory factor analyses for construct validity (*n* =12) or they only checked for face validity (*n* =6). However, face validity is the most superficial level of validity. Şencan (2003) suggests that researchers report construct validity for more robust validity analyses. In general, the researchers have reported high validity and reliability. However, researchers should repeat simple analyses to increase the validity and reliability of their instruments.

Among the studies we reviewed for this study, we found that measurement tools were generally developed for attitude (*n* =6) and identification/nomination (*n* =6) purposes. Identification represents a particularly prominent topic within the field of giftedness literature (Dai *et al.*, 2011), reflecting a clear research focus on this area and the consequent development of measurement tools for educators. Furthermore, the evaluation of an individual's beliefs, attitudes and perceptions regarding various aspects of education, including courses, enrichment activities and differentiation activities, represents another key area of interest within gifted education (Akgül, 2021; Kim, 2016; Laine *et al.*, 2019). A bibliometric analysis of these tools could help clarify their overall distribution more effectively. This would enable a more detailed examination of the current measurement tools developed for teachers of gifted students, using an alternative method. The measurement tools within these themes can also be applied in other studies to assess teachers' attitudes, behaviors, and perceptions. Further comments on the validity and reliability of these tools can be made in the future.

As suggested by Rammsted and Matthias (2019), researchers should conduct meta-analyses to quantitatively analyze the validity and reliability of measurement tools for teachers in the field of giftedness. In addition, researchers should conduct both systematic literature reviews and meta-analyses for the validity and reliability analysis of measurement tools developed for gifted

students. In this way, they can evaluate the objectivity of scales and the criteria for measuring instruments. An in-service training can be designed to help teachers to choose appropriate assessment tools for solid evaluation. Teachers should be trained in research methods to help them design appropriate interventions and develop or select measurement tools tailored to their specific needs, rather than relying solely on pre-developed tools.

This study has several limitations. First, only the Scopus and Web of Science databases were accessed, which may restrict the range of relevant studies. Additionally, publications after 2017 are limited in these databases, and as 2024 is not yet complete, the results may vary due to future additions.

Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest. This research study complies with research publishing ethics. The scientific and legal responsibility for manuscripts published in IJATE belongs to the authors.

Contribution of Authors

Sümeyye Arkan: Literature Review, Conceptualization, Visualization, Formal Analysis, and Writing-original draft. **Sema Tan**: Methodology, Supervision and Critical Review.

Orcid

Sümeyye Arkan https://orcid.org/0000-0001-7788-5917
Sema Tan https://orcid.org/0000-0002-9816-8930

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