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EDITED BY
Mohammad H. Al-khresheh,
Northern Border University, Saudi Arabia

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Northern Border University, Saudi Arabia
Amr Mohamed,
North Private College of Nursing, Saudi Arabia

*CORRESPONDENCE
Esra Ekinci Çelikpazu
✉ esra.ekinci@erdogan.edu.tr

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Development of the Grammar Learning Awareness Scale

Fazilet Taşdemir[1], Elif Atalay[2] and Esra Ekinci Çelikpazu[2]*

[1]Department of Educational Sciences, Faculty of Education, Recep Tayyip Erdoğan University, Rize, Türkiye, [2]Department of Turkish and Social Sciences, Faculty of Education, Recep Tayyip Erdoğan University, Rize, Türkiye

This study was conducted in order to develop a measurement tool to determine the awareness of why students learn grammar in their mother tongue. The sample of the research consists of 900 participants who continue their education at different grade levels in 6 high schools in a province in Turkey. As a result of the analysis, it was confirmed that the sub-factors of the scale were the components of the structure called grammar learning awareness and that they formed the determined structure together. The model-data fit indexes of the scale were found to be higher than the values accepted by the literature. Cronbach's Alpha internal consistency coefficient scale's sub-dimensions were 0.76 for "The Contribution of Grammar to Individual Development", 0.76 for "The Contribution of Grammar to Language Skills", 0.76 for "The Contribution of Grammar to Cognitive Functions" and 0.78 for "The Contribution of Grammar to Communication Skills". The internal consistency coefficient for the entire scale was determined as 0.83. The obtained values provided evidence showing that the Grammar Learning Awareness Scale is a valid and reliable measurement tool. It is thought that the contribution of grammar learning awareness to individual development, language skills, cognitive functions and communication skills can be measured by this scale.

KEYWORDS

grammar, grammar learning, awareness, scale development, measurement

1 Introduction

Language is a complex system that enables people to express their thoughts, feelings and experiences and to make sense of the world (Başkan, 2006). The language uses we choose/prefer are linguistic outcomes. Thinking about these results together with the reasons and/or purposes that bring them about unites language education with thought education. In the process of teaching the structure and functioning of language, students try to reach the knowledge of which language use is preferred and why. With this knowledge, they discover the nature/structure of language without detaching language from the language-culture, language-communication context. Thus, students are expected to become aware of the structure of language and why this structure is learnt.

Although it is recognized that grammar teaching is very important in language education (Sezer, 1994), questions remain about how learners understand the purpose and value of grammar learning. This awareness of the "why" behind grammar teaching is important as it can significantly affect learners' motivation, engagement and ultimately their ability to use language effectively (Ülper, 2020).

Although the importance of grammar awareness is recognized, there is a lack of instruments to measure this construct, especially in the context of mother tongue education. This study addresses this gap by developing and validating the Grammar Learning Awareness Scale for high school students. This scale specifically focuses on

students' awareness of why they learn grammar in native language classes. Therefore, the development of the grammar awareness scale for high school students is a deliberate choice that forms the basis of this research. The high school curriculum places great emphasis on grammar. In this period, students are expected to analyze texts and produce new original texts using the language structures they have learned. Students' awareness of why they learn grammar in mother tongue classes contributes to their language use skills. Research on grammar learning awareness among high school students can give direction to heritage language course practices.

The findings of the studies in this direction reveal the importance of assessing language awareness and especially grammar learning awareness. Therefore, it is important to develop practices to identify, assess and increase students' awareness of grammar learning. However, there is no scale specifically designed to measure students' awareness of grammar learning in the literature. In this study, it was aimed to develop the "Grammar Learning Awareness Scale" to determine whether high school students are aware of why they learn what they are taught about the structure/grammar of the language in the process of mother tongue teaching. In line with aim of this research, the following hypotheses were tested:

1. The Grammar Learning Awareness Scale under development is reliable.
2. The Grammar Learning Awareness Scale under development is valid.

2 Literature review

2.1 Language awareness

Awareness is a part of consciousness (Searle, 2016, p. 66), it is described as a "natural state of consciousness" and entails actively interacting in the present moment (Brown and Ryan, 2003; Shapiro et al., 2006). To be conscious of something is to be able to not only be inside it, but to look at it from the outside. What makes this possible is language (Erkman Akerson, 2007, p. 32). Considering the prerequisite for the ability to use language consciously, language awareness is also defined as the development of consciousness and sensitivity toward the forms and functions of language in learners, or the awareness that an individual develops against the characteristics and use of his own language (Büyükkantarcioglu, 2006; Carter, 2003; Svalberg, 2007). The concept of "language awareness" has been transformed into a form of tacit knowledge by means of explanatory information units, which are consciously learned by the individual during the education process in the name of language and metalanguage, repeated practices over time and mind control, and become a part of linguistic awareness. This is about putting the acquired knowledge and skills into practice in life (Büyükkantarcioglu, 2006). Therefore, language awareness is a state of consciousness that is not taught by the teacher or the textbook but is developed by the learner through the internal and gradual realization of language use (Barjesteh and Vaseghi, 2012).

According to Carter (2003), a general awareness of language includes: (a) awareness of some features of language, such as creativity and ambiguity, (b) awareness of the embedding of language in culture, (c) self-consciousness of the forms of language (Language is a system and is often systematically patterned), (d) Awareness of the close relationship between language and thought, in other words, seeing inside the language (cited in Andrews, 2007). In general, language awareness is a cognitive process that involves language use, discovering the formal features of language uses, and establishing and expressing the connections between form and function/meaning. This process overlaps with the main purpose of grammar teaching. Cognitive grammar (Langacker, 2008) sees grammar as an integral part of cognition and emphasizes the conceptual structures underlying grammatical forms.

2.2 Metalinguistic awareness and grammar learning

Metalinguistic awareness, which is an important component of language awareness, is defined as the ability to have conscious knowledge about the nature and structure of language, to think, to focus on different forms of language and to make judgements (Bialystok, 1986; Edwards and Kirkpatrick, 1999; Gaux and Gombert, 1999; Karmiloff-Smith, 1986). At the same time the term metalinguistic is used to describe many different language-related skills. For example, dividing a sentence into its basic and optional elements, dividing a word into syllables, dividing syllables into phonemes, deciding whether a sentence is grammatically correct or not, forming words by combining sounds, finding rhyming words, sound and word games and similar procedures are some of the procedures used to assess metadiscourse skills (Sayar and Turan, 2012).

Metalinguistic awareness involves cognitive processes such as being able to identify abstract rules in grammar, classify language elements and interpret the rules of language. Therefore, in terms of grammar teaching, metalinguistic awareness supports students' understanding of grammar not only as a set of memorized rules but also as a system that can be thought about and analyzed. This awareness helps students to develop their "thinking about language" skills in the process of comprehending grammatical rules. For example, a student with a developed metalinguistic awareness can analyze the structure of a sentence, distinguish grammatical elements such as subject, predicate, object and interpret the relationship between these elements. This process contributes to the advancement of cognitive development, especially in language learning. Metalinguistic awareness provides a level of consciousness in grammar teaching that enables the learner to analyze and internalize language, rather than simply transferring rules. This contributes to students' deeper understanding of grammatical structures and thus to the development and more effective use of their language skills (Jones and Oakey, 2024; Roehr-Brackin, 2024).

Grammatical awareness and metalinguistic awareness can be considered as two closely related concepts. Grammatical awareness is closely related to linguistic foundations and processes such as phonology, morphology, syntax and linguistic context. Thanks to these linguistic foundations, individuals realize not only the surface features of language but also its deep structural relations. Metalinguistic awareness, on the other hand, is a broader concept and includes the ability to consciously examine not only the structural features of language but also the relationship between

language and reality, the structure of language and its functions in communication contexts. It can be said that awareness of grammar, which strengthens the comprehension of the logical pattern/operation of the language and the order it presents, should be created in the students. Because learning grammar is an abstract skill, although it does not work on its own, it increases the level of language comprehension, which enables the person to gain the ability to use and master the language (Vygotsky, 2018, p. 80).

Students with high metalinguistic awareness become more active and independent in learning processes (Zadeh and Bahrouzi, 2020). In the studies reviewed in the literature, it has been seen that students with high language awareness perform better in school subjects and are better at achieving academic goals than those with less language awareness. For example, Nakatani (2005) stated that students with high language awareness produce longer sentences and control the message they convey; Francis (2002), language awareness facilitates writing skills; Brimo (2011) stated that syntactic awareness contributes significantly to reading comprehension; Güldenoğlu et al. (2016) stated that students with good phonological awareness decipher words faster and have higher reading comprehension scores than students with weak levels of phonological awareness; Carlisle (2000), on the other hand, revealed that morphological awareness contributes to comprehension success as it contributes to reading.

According to Piaget's Theory of Cognitive Development (Senemoglu, 2020), children can consciously analyse language structures as their abstract thinking skills develop. Especially in concrete operations (7–11 years old) and abstract operations (11 years old and above) stages, children can develop grammar awareness more effectively. Supporting this, research shows that metalinguistic awareness increases with age, metalinguistic development continues throughout childhood and even into adulthood (Edwards and Kirkpatrick, 1999; Flood and Menyuk, 1983; Acarlar et al., 2002).

A review of the literature reveals the importance of assessing language awareness, metalinguistic awareness and especially grammar learning awareness. Students' awareness of why they learn grammar enables them to develop their knowledge of language and to use language accurately, effectively and in accordance with its structure. It is of great importance to assess students' awareness of grammar learning and to develop strategies to increase this awareness. Therefore, it is thought that there is a need for a measurement tool to be used in determining students' awareness of why they learn grammar in the process of mother tongue and/or foreign language learning.

3 Methodology

3.1 Research design

This research is a scale development study that will be used to determine students' awareness of why they learn grammar. Based on the concept of scale development research, it is used to provide information about the targeted facts, events, people, system and subject, along with showing the measurement results (Yurdugül, 2005).

3.2 Sample and data collection

The participants of the research consist of 931 students who continue their education in six high schools in Erzurum in the 2021–2022 academic year in accordance with the purpose and research model of the research. Since the research was conducted for the purpose of scale development, it was considered that the research sample should be large to perform Explanatory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). In the literature, there is no definite criterion for the number of items tested or the size of the sample group, although some researchers state that the sample size should be at least five times the number of items tested, while some researchers suggest that it should be ten times larger (Child, 2006; Gorsuch, 2008; Kline, 1994). The number of people included in the sample was determined since the number of items for item analysis and factor analysis was (a) five times (a*5) in scale development studies (Tavşancil, 2010). Stratified sampling method was used in the selection of the sample. In stratified sampling, individuals with the same characteristics in the universe are divided into subgroups, these subgroups are called strata, and the sample is created by taking these strata separately (Canbazoglu Bilici, 2019). In stratified sampling, each substratum is sampled by simple random sampling (Balci, 2009). First, using the simple random sample approach, the province where the research will be conducted schools were chosen. The Provincial Directorate of National Education was contacted to get the total number of students enrolled in the province where the research was done. Next, each school's stratum was established by considering its High School Entrance Exam (HSEE)[1] success status and grade point average. In accordance with the proportional stratified sample, the weight of each stratum in the universe was calculated and the number of students in the strata was determined in accordance with the strata weight. The achievement status (percentile) of the schools where the research was conducted and information about the sample are given in Table 1.

The draft form was applied to students in Table 1. After cleaning the missing data in the data file, Explanatory Factor Analysis and Confirmatory Factor Analysis were applied on the data of the remaining 900 students.

3.3 Creation of the draft scale

In the study, the method suggested by Tezbaşaran (1996) for writing attitude items was used in determining the awareness statements. In determining the awareness items, it was aimed to collect information from a small sample as heterogeneous as possible representing the respondent population. In this direction, 94 students in the 10th grade were required to compose a paragraph describing why they had learnt Turkish grammar in their Turkish and Turkish Language classes throughout their academic careers, supporting their claims with positive and/or negative examples.

1 The Central Examination for High School Transition (HSEE), also known as the Transition to High School System, is an entrance exam system implemented by the Ministry of National Education of the Republic of Turkey starting from the 2017-2018 academic year.

TABLE 1 Characteristics of the sample group included in the scale development study.

Strata no	Schools	Total number of students in school	Strata weight	The number of participants in research
1	School with HSEE Placement (1.79)	514	0.16 (514/3,291)	149 (0.16*931)
2	School with HSEE Placement (3.47)	513	0.16 (513/3,291)	149 (0.16*931)
3	School with HSEE Placement (4.97)	571	0.17 (571/3,291)	158 (0.17*931)
4	School with HSEE Placement (10.96)	639	0.19 (639/3,291)	177 (0.19*931)
5	Placed School with Grade Point Average Outside the Scope of HSEE (Ort. 89)	571	0.17 (571/3,291)	158 (0.17*931)
6	Placed School with Grade Point Average Outside the Scope of HSEE (Ort. 75)	494	0.15 (494/3,291)	140 (0.15*931)
	Total		3,291	931

From the paragraphs written by the students, statements reflecting positive, negative or neutral emotional state were determined as scale items. The statements of the students including "thanks to what I learnt about grammar...," "thanks to grammar... I learnt...," "... happens with grammar teaching," "learning grammar is useful for..." etc. and the situations they stated were transformed into measurable items. For example, some of the statements written by the students are as follows:

> Student 22: "It helped me to improve my communication with people and to learn the meanings of unfamiliar words, so I was less criticized in my comments."
> Student 7: "I learned the mistakes I make in speaking and writing in daily life."
> Student 9: "It improved my general culture knowledge."
> Student 1: "I learned where the root of the words I use when I speak comes from. Now I form sentences knowing this and I answer confidently."
> Student 3: "I learn grammar in order to be a good listener, to show that I am listening by using body language and to answer questions adequately and correctly."

It was observed that the students' statements overlapped with Hudson's (1992, cited in Aydin, 1997) justifications for grammar teaching. These similarities were also taken into consideration in the writing of the items. After reviewing the grammar and awareness literature, an item pool consisting of 72 items was prepared with the information obtained.

3.4 Obtaining expert opinion and content validity

The 72-item draft form prepared was examined by five experts, three of which were in the field of Turkish Education, one in the field of Turkish Language and Literature Education, and one in the field of Measurement and Evaluation, apart from the researchers. Experts evaluated the items in terms of the presence of similar, incomprehensible/misunderstood expressions, not reflecting other psychological factors other than awareness, and being grammar learning awareness items. The items in the scale were tried to be expressed concisely and simply without causing different meanings. Items expressing extreme reactions were corrected (Tezbaşaran, 1996; Oppenheim, 1992).

Then, these expressions were presented to Turkish Education and Measurement and Evaluation experts, and their opinions were received using the Davis (1992) technique. In the Davis technique, expert opinions are graded in four categories from A to D, from "The item is definitely appropriate" to "The item is not appropriate." According to this technique, the number of experts who marked (A) and (B) is divided by the total number of experts to obtain the "Content Validity Rate" associated with the item (Davis, 1992). In line with this technique, experts were provided with detailed information and definitions to understand the conceptual framework of the study. They were then asked to evaluate how the concepts assessed were represented in the scale.

The experts used the form structured by the researchers to rate the appropriateness of each item and content validity was measured in line with the experts' opinions. Experts were experts in the field other than the scale developers. Expert opinions were evaluated 4-fold within the scope of technique. For every item in the technique "1- item does not represent the feature". Item 2 is in serious need of correction. Item 3 needs some tweaking. They were asked to mark as "4-item represents the feature". While each item was being evaluated, the number of experts who ticked (3) or (4) was divided by the total number of experts, and the content validity index (CVI) was found as a result of this process. Items with a CVI value of <0.80 were eliminated after each item was examined. The researchers revised the scale items by taking into account the evaluations and suggestions of the subject matter experts according to these four elements. Fifteen items that needed grammatical and spelling changes were deleted from the draft after expert review. Thus, efforts were made to assure the draft form's content validity. Following of the feedback, the scale consisting of 63 items, which was determined to be appropriate in terms of language, expression, and application time, has become ready for application. Table 2 shows the CVI values for each item in the draft scale.

The number of experts (evaluators) who were consulted for evaluation in the study was five. The minimum CVI value that the items must have in order to be included in the scale is 0.80. After the evaluation made according to this criterion, the items

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TABLE 2 CVI values.

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	CVI	Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	CVI
1	4	4	4	4	4	1.00	37	3	4	4	4	4	0.80
2	4	4	4	4	4	1.00	38	4	4	4	4	4	1.00
3	4	4	4	4	4	1.00	39	4	4	4	4	3	0.80
4	4	4	4	4	4	1.00	40	4	4	4	4	4	1.00
5	4	4	4	4	4	1.00	41	4	4	4	4	4	1.00
6	4	4	4	4	4	1.00	42	4	4	4	4	4	1.00
7	4	4	4	4	4	1.00	43	4	1	4	4	4	0.80
8	4	4	1	4	3	0.60	44	4	4	3	4	4	0.80
9	4	4	4	3	4	0.80	45	4	4	1	1	4	0.60
10	4	1	3	1	3	0.20	46	4	4	4	4	4	1.00
11	4	4	4	3	4	0.80	47	4	4	4	4	4	1.00
12	4	4	4	4	4	1.00	48	4	4	4	4	4	1.00
13	4	4	4	4	4	1.00	49	4	4	3	4	1	0.60
14	4	4	4	4	4	1.00	50	4	4	4	4	4	1.00
15	4	4	4	4	4	1.00	51	4	4	3	4	4	0.80
16	4	4	4	4	4	1.00	52	4	4	4	4	4	1.00
17	4	4	4	4	4	1.00	53	4	4	4	4	4	1.00
18	4	4	4	4	4	1.00	54	1	4	4	4	4	0.80
19	4	4	4	4	4	1.00	55	4	4	4	4	4	1.00
20	4	4	4	4	4	1.00	56	4	4	1	4	4	0.80
21	4	4	4	4	4	1.00	57	4	4	4	4	4	1.00
22	4	1	4	4	3	0.60	58	4	4	4	4	4	1.00
23	4	4	3	3	4	0.60	59	4	4	4	4	4	1.00
24	4	4	4	4	4	1.00	60	4	4	4	3	4	0.80
25	4	4	4	4	4	1.00	61	4	4	4	4	3	0.80
26	4	4	3	4	4	0.80	62	4	4	3	4	4	0.80
27	4	4	4	4	4	1.00	63	4	4	4	4	4	1.00
28	4	4	4	3	4	0.80	64	4	4	3	2	4	0.60
29	4	4	4	4	4	1.00	65	4	4	4	4	3	0.80
30	3	4	4	2	4	0.60	66	4	4	4	4	4	1.00
31	4	4	4	4	4	1.00	67	4	4	4	4	4	1.00
32	4	3	4	4	4	0.80	68	4	4	4	4	4	1.00
33	4	4	3	4	4	0.80	69	4	4	4	4	4	1.00
34	4	4	4	4	4	1.00	70	4	4	2	3	4	0.60
35	4	4	4	4	4	1.00	71	4	4	4	4	4	1.00
36	4	4	4	4	4	1.00	72	4	4	4	4	4	1.00

with sufficient CVI values remained in the scale. The other 15 items were removed from the scale. The CVI value for the entire scale was calculated as 0.88 by taking the average of the CVI values of the 63 items remaining in the scale. According to these results, it can be said that the draft scale consisting of 63 items measured the scope it aimed to measure at a rate of 87%.

3.5 Pre-testing of the scale

The 63-item draft scale form was evaluated using a five-point Likert type rating, which is popular in the field of social sciences, with the following responses: "strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1)" and A pre-testing

was made with 25 high school students to see whether the items in the draft form could be understood by the students. To determine how many minutes the students will complete the 63-item scale on average, the averages of the students who completed the scale first and the students who finished the last were taken. It was observed that the scale was completed in an average of 40–45 min. In the pilot application, this period was taken into consideration and the 2 items that the students had difficulty understanding were simplified and the scale form was finalized for the actual applications.

After the expert review and pilot application processes, the 63-item scale was applied in 6 high schools determined as high, medium, and low in terms of achievement level in the province where the data were collected. To determine whether the students filled out the scale randomly or not, "Please leave this item blank." was added as a control clause. Following the completion of the data gathering process, the collected data were organized to carry out the proper statistical operations.

3.6 Analyzing of data

The 63-item draft scale was applied to 931 participants, and the scale of 31 participants was not included in the analysis because it contained missing data (those who did not fill in the back page of the scale, those who left blank items, etc.). The analyses were conducted with the data obtained from 900 participants. Statistical analysis methods such as factor analysis, internal consistency analysis and hypothesis testing are used to examine the construct validity of the developed scale (Büyüköztürk, 2008). In this study, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted to determine the construct validity. Principal Component Analysis, Varimax Rotation and CFA were used to determine the factor structure of the scale. The model-data fit of the scale consisting of four factors determined as a result of EFA was then tested with CFA. The findings obtained from the application to develop the Grammar Learning Awareness Scale (GLAS) are given in the form of tables.

3.7 Ethics approval and consent to participate

Informed consent was obtained from all students participating in this study. The study was approved by the Ministry of National Education of the Republic of Turkey. Ethics committee approval was obtained from Recep Tayyip Erdogan University Social Sciences Ethics Committee.

4 Findings/results

Cronbach Alpha reliability coefficient, EFA and CFA values, which are required for each step in the development of a scale and for each sub-factor, are included in the findings without excluding any of them. In addition, each of the model fit indices, which are emphasized in other scale development studies, are also commented on in the findings. There is no model fit index that was excluded. The accepted ranges for the fit indices are as stated in their citations. These ranges were taken as criteria and interpreted.

4.1 Reliability studies of Grammar Learning Awareness Scale

In order to test the hypothesis "The Grammar Learning Awareness Scale under development wss reliable", reliability studies were conducted first.

H_1 = The scale being developed was not reliable.

Before the construct validity analysis, the item analysis of the scale was made and the item-total score correlations of 63 items in the scale were examined. It was determined that the correlation coefficients of the items in the scale were between $r = 0.02$ and 0.68, and the item-total correlation values of three items (m6, m8, m36) were between $r = 0.02$ and 0.10 and were lower than the desired level. According to Büyüköztürk (2008), items with an item-total correlation of 0.30 and higher distinguish the feature to be measured in the best degree. Therefore, because of the analysis, it was decided to remove three items with $r = 0.30$ from the scale and the number of scale items decreased to 60. To increase the reliability of the data, more than one item measuring similar awareness of why they learned grammar was retained in the scale (Frankaenkel et al., 1996). In terms of being a scale development study, it was considered that the research required a large sample to perform EFA and CFA.

Regarding the reliability of the scale, the Cronbach Alpha reliability coefficient of the scale and its subscales was calculated to determine how consistent the items of the scale were with each other and with the total test scores (internal consistency). The internal consistency coefficient obtained for the scale was determined as Cronbach's alpha = 0.96 for 63 scale items.

The Cronbach Alpha value increased when the item was discarded. Cronbach's Alpha = 97 for the number of items with an internal consistency coefficient of 60 for the scale. According to Özdamar (2002), internal consistency coefficients are, if $0.00 \leq \alpha < 0.40$, the scale is unreliable, if $0.40 \leq \alpha < 0.60$, the scale is of low reliability, if $0.60 \leq \alpha < 0.80$, the scale is quite reliable, if $0.80 \leq \alpha < 1.00$, the scale is a highly reliable scale. When the internal consistency coefficients were examined, it was seen that the Grammar Learning Awareness Scale had a high level of reliability, $\alpha = 0.83$, before the construct validity analysis. H_0 hypothesis was accepted. Validity studies were started for the scale, which was determined to be reliable.

4.2 Validity studies of Grammar Learning Awareness Scale

Validity studies were conducted to test the hypothesis that "The Grammar Learning Awareness Scale under development was valid".

H_1 = The scale being developed was not valid.

There are several criteria for applying Explanatory Factor Analysis to a data set for evaluating the validity of scale development studies. The first of these is related to sample size. The

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TABLE 3 Item-total correlations of the scale and Cronbach Alpha values when the item is removed.

Item	Item-total correlations	Cronbach Alpha values when the item is removed	Item	Item-total correlations	Cronbach Alpha values when the item is removed
M1	0.445	0.965	M33	0.653	0.964
M2	0.503	0.965	M34	0.677	0.964
M3	0.532	0.965	M35	0.609	0.964
M4	0.509	0.965	M36	0.055	0.966
M5	0.447	0.965	M37	0.582	0.964
M6	−0.038	0.967	M38	0.578	0.964
M7	0.478	0.965	M39	0.591	0.964
M8	−0.087	0.967	M40	0.547	0.965
M9	0.559	0.965	M41	0.622	0.964
M10	0.540	0.965	M42	0.573	0.964
M11	0.554	0.965	M43	0.550	0.965
M12	0.475	0.965	M44	0.637	0.964
M13	0.481	0.965	M45	0.637	0.964
M14	0.535	0.965	M46	0.668	0.964
M15	0.509	0.965	M47	0.680	0.964
M16	0.540	0.965	M48	0.610	0.964
M17	0.553	0.965	M49	0.630	0.964
M18	0.525	0.965	M50	0.597	0.964
M19	0.567	0.964	M51	0.612	0.964
M20	0.536	0.965	M52	0.677	0.964
M21	0.573	0.964	M53	0.601	0.964
M22	0.600	0.964	M54	0.649	0.964
M23	0.568	0.964	M55	0.650	0.964
M24	0.610	0.964	M56	0.612	0.964
M25	0.606	0.964	M57	0.614	0.964
M26	0.618	0.964	M58	0.559	0.965
M27	0.590	0.964	M59	0.589	0.964
M28	0.554	0.965	M60	0.604	0.964
M29	0.611	0.964	M61	0.599	0.964
M30	0.577	0.964	M62	0.588	0.964
M31	0.643	0.964	M63	0.466	0.965
M32	0.707	0.964			

sample size is a very important criterion for the generalizability and stability of factor analysis results, and a ratio of ten observations per variable (1:10) is recommended for reliable factor results. In factor analysis, for sufficient sample size, it is stated as "50 very poor, 100 poor, 200 moderate, 300 good, 500 very good, and 1,000 excellent" (Çokluk et al., 2010). The Kaiser-Meyer-Olkin (KMO) test and the Bartlett Test of Sphericity were used to determine whether the factor analysis of the data was appropriate and whether the correlations between the variables to be analyzed were significant and different from zero. Related findings are presented in Table 3.

When the analysis results in Table 4 are examined, it is seen that the KMO coefficient is 0.974. This value is expected to be equal to or >0.70 (Hair et al., 1998, p. 99). KMO value, which can take a value between 0 and 1. Normal between 0.5 and 0.7, 0.7 to 0.8 is fine, between 0.8 and 0.9 very good and if it is over 0.9, it is interpreted as perfect (Field, 2005).

This finding shows that the sample size is suitable for factor analysis. It is seen that it is related to the Bartlett sphericity test ($\chi 2 = 27{,}059.918$; $p < 0.05$). It is seen that the chi-square value is significant at the $p < 0.05$ significance level. The Barlett

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TABLE 4 Kaiser-Meyer-Olkin coefficient and Bartlett Test of Sphericity results.

Kaiser-Meyer-Olkin Test (KMO)		0.974
Bartlett Test of Sphericity	X^2	27.059.918
	sd	1.770
	p	0.000

Test of Sphericity is used to test whether the correlation matrix is the unit matrix and according to the result, it is determined whether the factor model is appropriate or not (Akgül, 1997). In addition, if the Bartlett Test of Sphericity is significant, it is interpreted that the sample size is good for factor analysis and the correlation matrix is appropriate (Büyüköztürk, 2008; Field, 2005; Tabachnick and Fidell, 1996). Based on these data, the draft scale was found to be suitable for factor analysis. EFA was applied to the Grammar Learning Awareness Scale, which consists of 60 items after subtracting m6, m8, m36 with a common factor variance below 0.30. There are seven factor extraction methods in exploratory factor analysis. These are principal component analysis (PCA), principal axis factor analysis (FA), maximum likelihood analysis (ML), image-factor analysis (IF), unweighted least squares analysis (ULS), generalized least squares analysis (GEK) and alpha analysis (AF). The most frequently used factor extraction method is principal component analysis (Büyüköztürk, 2008; Brown, 2006; Fabrigar et al., 1999; Gorsuch, 2008; Kline, 2011; Mulaik, 1972; Şencan, 2005; Tatlidil, 1992). Among these techniques, principal component analysis (PCA) aims to extract the maximum variance for each component.

On the other hand, the purpose of principal axes analysis (CAA) is to produce a new correlation matrix in which the factors are orthogonal to each other and to reveal the latent structure (Tabachnick and Fidell, 2007; Şencan, 2005). First, Principal Component Analysis (PCA) was applied to determine the principal factors and Varimax rotation method, which is one of the orthogonal rotation methods, was applied to interpret the factors and ensure their significance. The general purpose of PCA is data reduction and interpretation (Johnson and Wichern, 2002).

It reduces a large number of variables to a smaller number of variables without losing information and increases the power of interpretation. PCA is a linear analysis. While the principal components are expressed algebraically as a linear combination of p random variables (x1, x2,..., xp), geometrically linear combinations yield a new coordinate system by rotating the original axes. The new axes represent the directions of highest variability (Johnson and Wichern, 2002).

Whichever method is used to reveal factors or components, similar results are obtained with a good data set, and different rotation methods tend to give similar results when correlations are quite significant (Tabachnick and Fidell, 2007). PCA reduces the variables and the new reduced variables, called components, are simply linear combinations of the original variables. The first principal component maximally discriminates between participants in the sample, has a large sample variance. PCA is considered the most common method of estimating pattern coefficients as it is the default procedure (Schreiber, 2021).

TABLE 5 Explained variance values of the draft scale.

Components	Total explained variance								
	Initial eigenvalues			Extraction of sum of squares of charges			Rotation of sum of squares of loads		
	Total	% variance	Cumulative %	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %
1	21.845	36.409	36.409	21.845	36.409	36.409	5.981	9.968	9.968
2	2.448	4.079	40.489	2.448	4.079	40.489	5.388	8.979	18.948
3	1.907	3.178	43.667	1.907	3.178	43.667	4.714	7.856	26.804
4	1.432	2.387	46.054	1.432	2.387	46.054	4.340	7.234	34.038
5	1.362	2.270	48.324	1.362	2.270	48.324	4.339	7.232	41.269
6	1.244	2.073	50.397	1.244	2.073	50.397	2.999	4.999	46.268
7	1.047	1.745	52.142	1.047	1.745	52.142	2.506	4.176	50.444
8	1.022	1.703	53.845	1.022	1.703	53.845	2.040	3.401	53.845

Explained Variance Values of the draft scale are presented in Table 5. When the results of Principal Components Analysis are examined in Table 4, it is seen that the Grammar Learning Awareness Scale consisting of 60 items explains 53.845% of the total variance. In the draft scale, an 8-factor structure with an eigenvalue above 1.00 emerged. The line plot (Scree Plot) and the percentage of contribution to the total variance are the most frequently used criteria in deciding the factor number of the scale (Tabachnick and Fidell, 2007; Tavşancil, 2010).For scale development, commonly available methods to determine the number of factors to retain include a scree plot (Er and Topçuoglu, 2016), the variance explained by the factor model, and the pattern of factor loadings (Raykov and and Marcoulides, 2011). Where feasible, researchers could also assess the optimal number of factors to be drawn from the list of items using either parallel analysis, minimum average partial procedure (Velicer, 1976), or the Hull method (Lorenzo-Seva et al., 2011).

Other criteria and sources are also used to determine the number of factors. For the case of a analysis, these sources include the KMO scores and the scree plot, the collectivity of the PCs, the correlations between the PCs, RMSD mode plots, two-dimensional scatter plots of observations projected on the PCs, the cosine content of the squared-cosines for variables. When the eigenvalues are plotted against mode index that are presorted from highest to lowest variance, a "scree plot" typically appears as a function of mode index. The choice of which modes to include is often made by examining the scree plot for a visible "kink" (Cattell, 1966; Cattell and Vogelmann, 1977), such that all modes up to the kink are important. Hence the name scree plot has been tied to PCA. Other criteria are commonly used for the choice of essential modes. The scree plot provides an objective criterion. In this analysis, the scree plot was used.

It is recommended to reduce the number of factors by performing a Scree Plot and to select the factors up to the first sudden change in the slope of the graph curve (Kline, 1994). The Scree Plot test result is given in Figure 1. The first abrupt change in the eigenvalue after 1 in the graph produced by the Scree Plot test occurred in the fourth factor.

According to the Scree Plot test results, it appears that the scale may have four factors. It is accepted that items with factor load values of 0.30 and higher in the rotation processes performed in EFA distinguish individuals well, and items that are 0.40 and above are considered to be very good (Büyüköztürk et al., 2008). For this reason, items with factor loadings of 0.30 and above were kept in the analysis.

Before the Scree Plot, no decision was made about how many factors the scale should have or how many factors should be retained, and the analysis continued according to the result. In the Varimax vertical rotation applied to the data, overlapping/dish items that were below 0.30 and loaded on more than one factor were removed. After the factor analysis, the eigenvalue, variance and total variance explanation percentages of the factors and the factor loadings of the items are shown in Table 6.

In Table 6, it is seen that the item-total correlations of the items above 0.30 after Varimax vertical rotation were appropriate, and the common factor variance values in which the factors were explained together in any item were examined. During the factor analysis, items with factor loadings >0.30 and factors with eigenvalues >1 were processed (Tabachnick and Fidell, 2007). After rotation, m40, m48, m60, m31, and m32, respectively, were excluded from the data because of overlapping/contamination in the items. Items with a difference of <0.10 in the loadings of an item on two factors were excluded from the scale. Fifty-five items in the Grammar Learning Awareness Scale were grouped under four factors/dimensions.

According to Tabachnick and Fidell (2007), 0.32 is a reasonable rule of thumb for the minimum loading of a factor item, which corresponds to about 10% cross-loading variation with the variance of other factor items. A "cross-loading" item has a loading factor on two or more variables at the same time. When assessing whether to remove a cross-loading item from the scale, we consider whether there are a sufficient number of strong loaders (0.50 or more) on each component to support elimination. When there is cross-loading, it is possible that the items are poorly constructed or the a priori factor structure is faulty. According to Çokluk et al. (2010), cross-loading items are items that load highly on more than one component and have <0.10 difference between these loadings. Table 7 shows the expected total variance values and eigenvalues.

As seen in Table 7, as a result of the EFA, it was seen that 55 items were collected, 21 under Factor 1, 13 under Factor 2, 13 under Factor 3, and 8 under Factor 4. The first dimension of the Grammar Learning Awareness Scale was named as "The Contribution of Grammar to Individual Development", the second dimension as "The Contribution of Grammar to Language Skills", the third dimension as "The Contribution of Grammar to Cognitive Functions" and the fourth dimension as "The Contribution of Grammar to Communication Skills". When the variance of the scores obtained from the determined 55 items is examined, it is seen that 15.630% are explained by the first dimension/factor, 10.934% by the second factor, 10.77% by the third factor, and 9.023% by the fourth factor. The percentage of explanation of the total variance of the four-factor scale was 46.357%. It is considered sufficient that the variance explained in multi-factor models is between 40 and 60% (Çokluk et al., 2010). The high variance ratio explained demonstrates the designed scale's factor structure's robustness (Gorsuch, 2008). Scherer et al. (1988) state that the variance ratio in the social sciences should be between 40 and 60%. For this reason, the explained variance ratio provided the scale development criterion for social sciences.

4.3 Confirmatory factor analysis results

The adequacy of the four-factor structure that resulted from the Explanatory Factor Analysis was examined in this section of the study. The factors were not created by the researchers beforehand. The dimensions formed as a result of the Exploratory Factor Analysis were named as factors according to their content. For this purpose, the test results of the measurement model in which the relationships between the observed and latent variables in the research model are tested through Confirmatory Factor Analysis are given. Whether the data showed normal distribution or not was examined with the Shapiro-Wilk test. In addition, the fact that the z-values for the skewness and kurtosis values of the data exceed ±

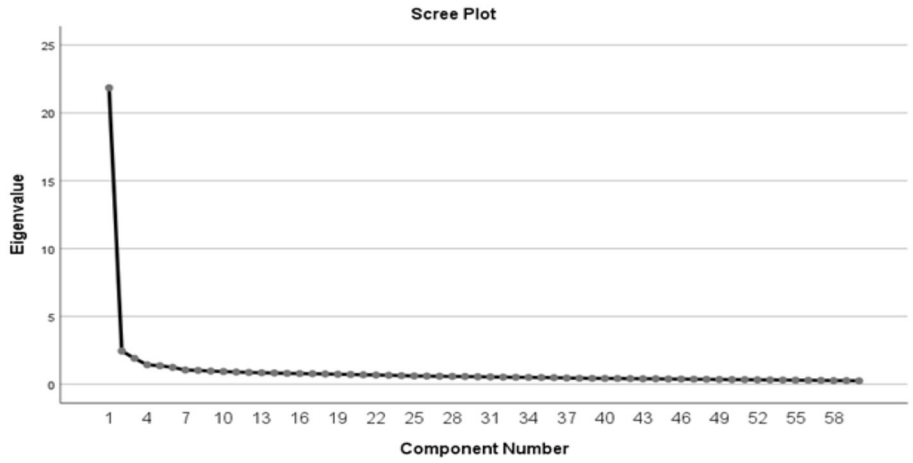

FIGURE 1
Scree plot of the draft scale.

TABLE 6 Factor loads matrix after Varimax rotation method.

Item	1	2	3	4	Item	1	2	3	4	Item	1	2	3	4
M49	0.707									M14				0.725
M51	0.696				M5		0.581			M13				0.702
M54	0.653				M8		0.574			M20				0.693
M50	0.642				M6		0.543			M22				0.684
M32	0.608				M7		0.492			M23				0.625
M15	0.593				M4		0.491			M12				0.587
M46	0.587		0.370		M17	0.346	0.483			M21				0.570
M25	0.567				M27	0.349	0.448			M10		0.356		0.373
M33	0.561				M16	0.317	0.431		0.330					
M53	0.558				M11		0.423							
M48	0.539		0.314		M9	0.393	0.418							
M28	0.501				M36			0.615						
M40	0.495		0.428		M44			0.611						
M47	0.484		0.459		M38			0.609						
M19	0.473	0.362			M37			0.607						
M31	0.469		0.415		M43		0.333	0.591						
M39	0.468		0.454		M42		0.302	0.555						
M55	0.468				M45	0.486		0.506						
M24	0.451	0.405			M35	0.347		0.462						
M18	0.388	0.383			M30	0.377	0.389	0.453						
M26	0.358	0.321			M41	0.413		0.441						
M3		0.610			M52	0.387		0.423						
M2		0.610			M29	0.340	0.311	0.421						
M1		0.604			M34		0.309	0.405						

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2.58 means that the hypothesis that the distribution is normal can be rejected at the probability level of 0.01 (Hair et al., 1998, p. 73). In light of this information, Table 8 provides the data's skewness, kurtosis scores, and related tests.

When Table 8 is examined, F1 ($\bar{x} = 76$, Median = 78, Mode = 79), F2 ($\bar{x} = 49$, Median = 50, Mode = 51), F3 ($\bar{x} = 49$, Median = 50, Mode = 52), F4 ($\bar{x} = 31$, Median = 31, Mode = 32) and scale total scores ($\bar{x} = 204$, Median = 207, Mode = 203) showed normal distribution. Confirmatory Factor Analysis is a technique for evaluating the reliability of specially designed measuring tools. It is used to ascertain whether the factor structure of the original form of the scale will be confirmed or not.

According to Sümer (2000), CFA is an analysis to evaluate the extent to which the factors formed from many variables, supported by a theoretical basis, agree with the real data. In other words, CFA aims to examine the extent to which a predetermined or constructed structure is confirmed by the collected data. Many fit indices are used to demonstrate the adequacy of the model tested in CFA. Chi-square fit test (Chi-Square Goodness), GFI (Goodness of Fit Index), RMSEA (Root Mean Square Error of Approximation), CFI (Comparative Fit Index), NFI (Normed Fit Index), RFI for DFA performed in this study (Relative Fit Index), IFI (Incremental Fit Index) and AGFI (Adjusted Goodness of Fit Index) fit indices were examined. under DFA. The $\chi 2/df$ value was found to be 3.115. It is seen that the model has an acceptable fit. A value of 2 or less indicates that the model is a perfect model, and a value of 5 or less indicates that the model has an acceptable goodness of fit (Sümer, 2000). The Confirmatory Factor Analysis Model is given in Figures 2, 3.

Regression values show the power of observed variables to predict latent variables, factor loadings. When the standardized regression values of each item in the model are examined after CFA, it is seen that the values of the items vary between 0.489 and 0.772. Factor loads are expected to be above 0.50 (Hair et al., 1998). However, there is also a different range interpretation for this coefficient. According to Kline (1994), standardized regression coefficients of 0.10 and below represent a small effect, standardized coefficients of 0.30 and around represent a medium effect, and standardized regression coefficients of 0.50 and above represent a large effect. Since it is not desirable to remove items that would disrupt the structure in scale development studies, the interpretation was made according to Kline and items with values such as 0.489, 0.497 were retained as stated below.

When the standardized regression loads of 55 items in the scale are examined in Table 9, no item with a value below 0.50 was observed. Since two items were very close to the 0.50 value and removal of items from the scale was not preferred unnecessarily (m10 = 0.489, m55 = 0.497), the items were not removed from the scale. Model fit indices of 55 items in the scale are as follows:

When the fit values were examined according to Table 10, the RMSEA value was found to be 0.048. A RMSEA value ≤ 0.05 indicates a perfect fit, and <0.08 indicates a good fit. Browne and Cudeck (1989) stated that "an RMSEA value of ~0.05 or lower indicates a close fit of the model in relation to the degrees of freedom" and "a value of approximately 0.08 or lower indicates a close fit of the model". The fit index obtained because of this analysis shows that the model has a good fit. SRMR = 0.05, When the GFI and AGFI fit indices of the model are examined, it is

TABLE 7 Eigenvalues of the sub-dimensions in the scale and total variances explained.

Components	Total explained variance								
	Initial eigenvalues			Extraction of sum of squares of loading			Extraction of sum of squares of rotation		
	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %
1	19.823	36.041	36.041	19.823	36.041	36.041	8.597	15.630	15.630
2	2.407	4.376	40.417	2.407	4.376	40.417	6.014	10.934	26.564
3	1.861	3.384	43.801	1.861	3.384	43.801	5.924	10.770	37.335
4	1.406	2.556	46.357	1.406	2.556	46.357	4.962	9.023	46.357

TABLE 8 Data normality test.

		Statistics	Standard deviation			Statistics	Standard deviation
F1	Average	76.26	0.515	F4	Average	30.54	0.201
	Median	78.00			Median	31.00	
	Mode	79			Mode	32	
	Variance	238.855			S	6.030	
	S	15.455			Minimum	8	
	Minimum	21			Maximum	40	
	Maximum	105			Skewness	−0.483	0.082
	Skewness	−0.455	0.082		Kurtosis	−0.114	0.163
	Kurtosis	0.157	0.163				
F2	Average	48.60	0.282	Scale	Average	204.44	1.179
	Median	49.50			Median	207.00	
	Mode	51			Mode	203	
	S	8.471			Variance	1,250.353	
	Minimum	13			S	35.360	
	Maximum	65			Minimum	55	
	Skewness	−0.519	0.082		Maximum	275	
	Kurtosis	0.335	0.163		Skewness	−0.416	0.082
F3	Average	49.0456	0.31340		Kurtosis	0.292	0.163
	Median	50.0000					
	Mode	52					
	S	9.40210					
	Minimum	13.00					
	Maximum	65.00					
	Skewness	−0.554	0.082				
	Kurtosis	0.477	0.163				

seen that GFI = 0.83, AGFI = 0.82 and TLI = 0.93. GFI and AGFI indices above 0.95 correspond to perfect fit, and above 0.90 correspond to good fit. The GFI and AGFI values in this framework can be observed to be at acceptable fit values for the analysis. It is stated that GFI values above 0.85 are acceptable (Sürücü et al., 2021). At the same time, although it is stated that GFI values above 0.80 are acceptable values, it is seen that values above 0.90 are frequently preferred in the literature (Chow et al., 2001). AGFI value of 0.80 and above indicates an acceptable fit (Hu and Bentler, 1999). When the NFI and CFI fit indices are examined in the final analysis, it is seen that they have NFI = 0.82 and CFI = 0.87 values. NFI and CFI indices above 0.95 correspond to perfect fit, and above 0.90 correspond to good fit (Bollen, 1989; Browne and Cudeck, 1989; Byrne, 2010; Hu and Bentler, 1998; Kline, 2011; Tanaka and Huba, 1985). The NFI value is between 0 and 1, and a threshold value of 0.90 is considered to indicate good fit (Hu and Bentler, 1999).CFI values between 0.90 and 0.95 and above 0.95 indicate an acceptable level of fit (Hu and Bentler, 1999; Marsh et al., 2004). In addition to these acceptable ranges, a CFI value above 0.80 is also reported to indicate an acceptable fit (Chow et al., 2001). Accordingly, it was seen that the NFI and CFI values had an acceptable fit for the analysis. One reason why researchers use fit indices instead of exact model testing to determine model fit is that the X^2 test detects increasingly smaller differences between the experimental and model-specified covariance matrices with increasing sample size (Steiger and Lind, 1980). Since the chi-square statistic is affected by the sample size very quickly, the X^2/sd ratio, which is less affected by the sample, is a criterion that can be used instead (Waltz et al., 2010). This value five or less is an acceptable value (Hooper et al., 2008). $\chi^2/sd \leq 2$ is an excellent fit. $\chi^2/sd \leq 3$ is an acceptable fit (Kline, 2011). $3 < \chi^2/sd < 5$ there is a moderate level of fit (Sümer, 2000). It is the most important criterion of model data fit. After CFA, the Grammar Learning Awareness Scale took its final form as 55 items with four factors.

These findings collectively demonstrate that the model-data fit is satisfactory. In other words, it can be said that the 4-factor model is appropriate, and the construct validity of the scale is ensured. As such, the scale can be used to measure the level of awareness of students about why they learn grammar.

A cut-off score (criterion) was determined for the four factors of the developed scale. This determination

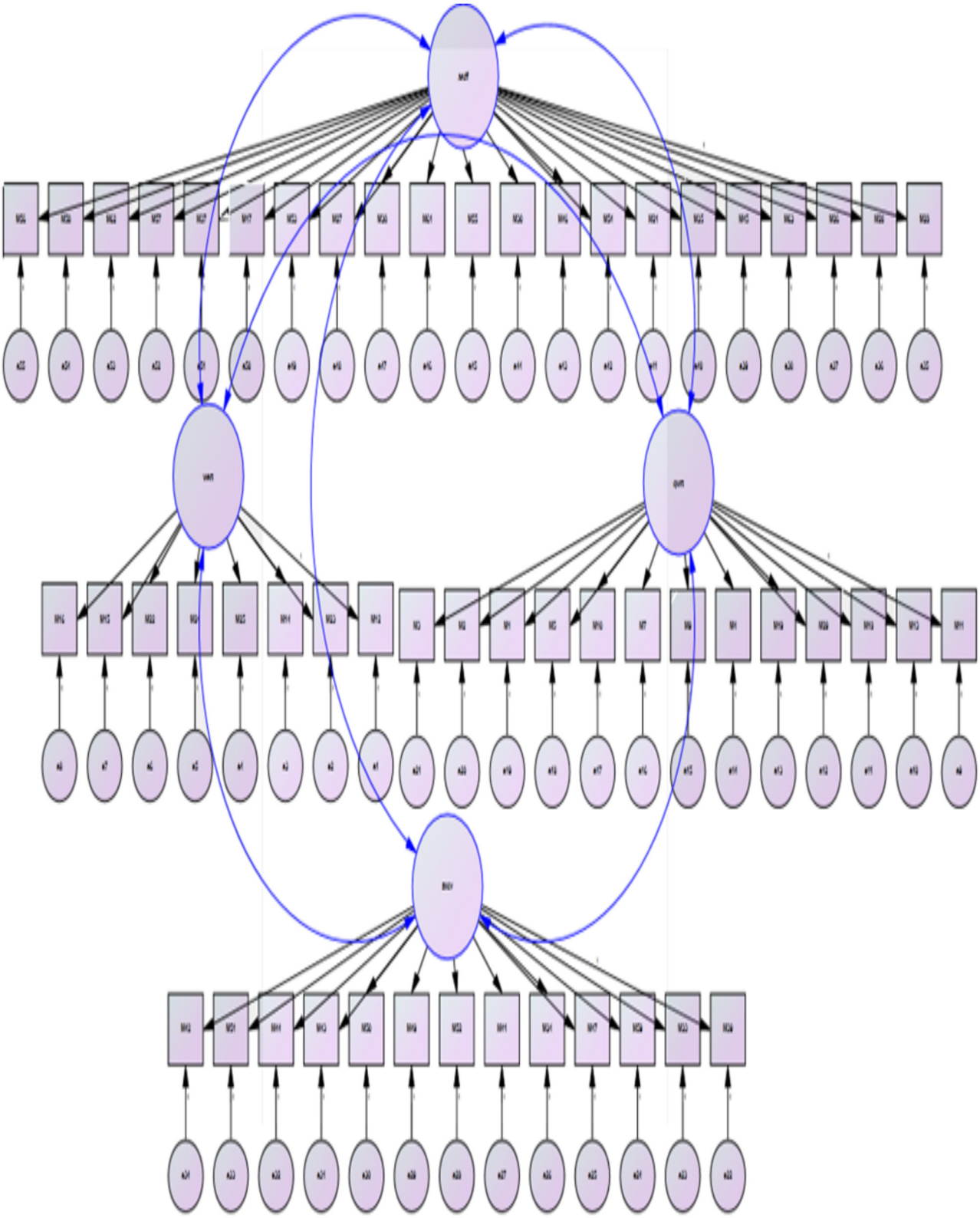

FIGURE 2
Confirmatory factor analysis fit model. Chi-Square, 4435.068; Sd, 1,424; P, 0.000; RMSEA, 0.048.

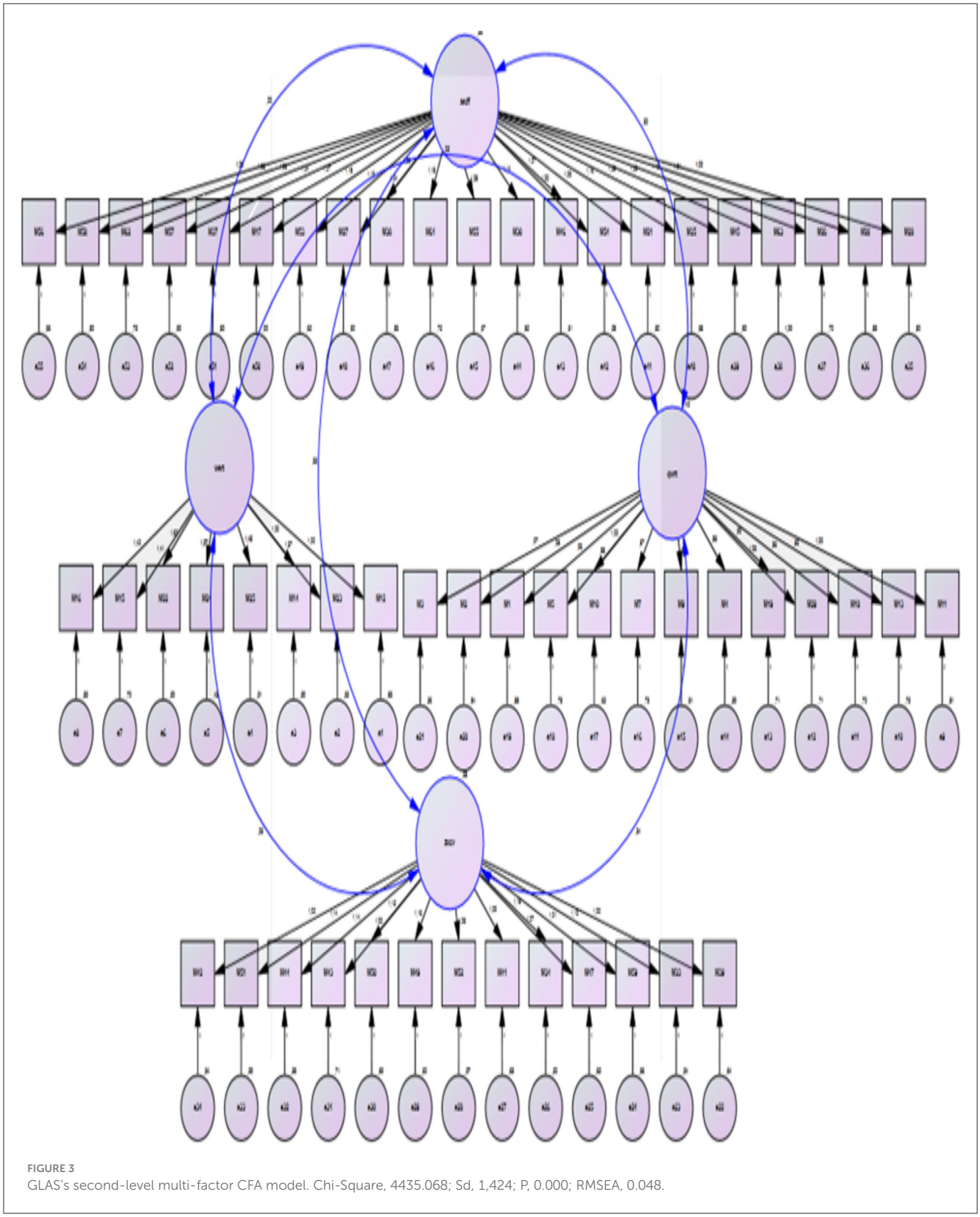

FIGURE 3
GLAS's second-level multi-factor CFA model. Chi-Square, 4435.068; Sd, 1,424; P, 0.000; RMSEA, 0.048.

is generally not taken into account in scale development studies. However, there is no possibility of comparison and interpretation for those who use the scale for this reason. In this study, cut-off scores were also included to enable researchers to compare and classify the total and sub-factor scores of the scale. In this respect, the scale contributes to the field. These ranges are detailed in the comments below (Tables 11–14).

"The Contribution of Grammar to Individual Development" factor has a minimum score requirement of 21 and a maximum

score requirement of 105. The arithmetic mean of this factor was found as ($\bar{x} = 76$). For this factor;

1. 1–47-point range—low level.
2. Range of 48–76 points—intermediate.
3. A score range of 77–105—high level of the contribution of grammar to individual development.

The minimum score that can be obtained from "The Contribution of Grammar to Language Skills" factor is 13, and the maximum score is 65. The arithmetic mean of this factor was found as ($\bar{x} = 49$). For this factor;

1. 1–33 points range—low level.
2. 34–49-point range—intermediate.
3. The 50–65-point range has been determined as high level of the contribution of grammar to language skills.

The minimum score that can be obtained from the factor titled "The Contribution of Grammar to Cognitive Functions" is 13 and the maximum score is 65. The arithmetic mean of this factor was found to be ($\bar{x} = 49$). For this factor;

1. Score range 1–33—low level.

TABLE 9 Standardized regression values of items.

Item	Value	Item	Value
M10	0.489	M42	0.673
M21	0.685	M43	0.649
M12	0.622	M37	0.592
M23	0.728	M38	0.683
M22	0.772	M44	0.672
M20	0.761	M36	0.618
M13	0.653	M26	0.556
M14	0.698	M18	0.553
M9	0.584	M24	0.636
M11	0.527	M55	0.497
M16	0.546	M39	0.677
M27	0.634	M31	0.642
M17	0.605	M19	0.589
M4	0.588	M47	0.685
M7	0.634	M40	0.698
M6	0.549	M28	0.596
M8	0.627	M48	0.682
M5	0.540	M53	0.631
M1	0.539	M33	0.623
M2	0.570	M25	0.638
M3	0.640	M46	0.660
M34	0.610	M15	0.591
M29	0.678	M32	0.642
M52	0.609	M50	0.664
M41	0.698	M54	0.656
M34	0.712	M51	0.629
M41	0.648	M49	0.687
M45	0.716		

TABLE 11 Items related to the factor of the contribution of grammar to individual development.

Item	Statements
49	I gain greater life experiences from what I study about grammar.
51	I organize my life thanks to what I learn about grammar.
54	I know myself thanks to what I have learned about grammar.
50	Learning grammar makes my life easier.
32	Knowing the rules of the language improves my awareness of taking responsibility.
15	I make sense of my own existence thanks to what I have learned about grammar.
46	I am socially accepted thanks to what I have learned about grammar.
25	I get the world right.
33	I empathize with others thanks to what I have learned about grammar.
53	I think creatively thanks to what I have learned about grammar.
48	I feel confident thanks to what I have learned about grammar.
28	I learn our culture better.
40	Thanks to what I learned about grammar, I contribute to the development of the language by using the language correctly.
47	I'm literate because of what I've learned about grammar.
19	I will succeed in other lessons as well because of the grammar lessons I have acquired.
31	What I learn about grammar makes me realize the beauty of the language.
39	I learn grammar to improve myself.
55	What I learn about the structure of the language makes it easier for me to learn a foreign language.
24	What I learn about grammar contributes to my daily life.
18	I learn grammar because it is the foundation of language.
26	I understand the deep structure of sentences.

TABLE 10 CFA fit indices of the grammar learning awareness.

Fit indices										
RMESA	NFI	CFI	IFI	RFI	TLI	GFI	AGFI	X^2	DF	CMIN/DF
0.048	0.82	0.87	0.87	0.81	0.86	0.83	0.82	4,435.068	1,424	3.115

TABLE 12 Items related the factor of the contribution of grammar to language skills.

Item	Statement
3	I adhere to the grammar rules of the language because of what I have learnt about them.
2	I now understand how the grammatical structure of the language is formed thanks to what I have learnt about grammar.
1	Because of what I've learned about grammar, I can now correct other people's grammatical errors.
5	I use language more effectively when writing.
8	I utilize the language more carefully when writing now that I know more about grammar.
6	I learn the rules of the language.
7	I utilize the language more carefully when speaking now that I know more about grammar.
4	I use language more effectively when speaking.
17	I use what I learned about grammar in my daily life.
27	I learn grammar to eliminate misunderstanding.
16	Thanks to what I learned about grammar, I pass the course easily.
11	I can better understand the text I read.
9	I like my language thanks to what I learned about grammar.

TABLE 13 Items related factor of the contribution of grammar to cognitive functions.

Item	Statements
36	I read with attention to emphasis, pause and intonation.
44	I can construct sentences as a result of what I have learnt about grammar.
38	I talk clearly now because of what I've learnt about grammar.
37	I speak with attention to emphasis, pause, and intonation.
43	I now understand the grammatical errors I made while writing as a result of what I learnt about it.
42	I now understand the grammatical errors I made while speaking as a result of what I learnt about it.
45	I improve myself thanks to what I learn about grammar.
35	I learn that every form in the language has a meaning.
30	My language consciousness is formed.
41	Grammar helps me establish part-whole relationships.
52	I use language consciously.
29	I interpret the relationships between concepts more accurately.
34	I pronounce the words in the language correctly.

2. 34–49 score range—intermediate.
3. 50–65 score range—high level is determined as the contribution of grammar to cognitive functions.

The minimum score that can be obtained from The Contribution of Grammar to Communication Skills factor is 8 and the maximum score is 40. The arithmetic mean of this factor was found to be ($\bar{x} = 31$). For The Contribution of Grammar to Communication Skills;

1. 1–22 score range—low level.
2. 23–31-point range—moderate level.

TABLE 14 Items related to the factor of the contribution of grammar to communication skills.

Item	Statements
14	I express my thoughts better
13	I describe my feelings better.
20	I express myself better.
22	I express my thoughts correctly.
23	I express my thoughts effectively.
12	I communicate with people in a healthy way.
21	I can produce correct thoughts.
10	When I listen to a text, I comprehend it better.

TABLE 15 Correlations of Grammar Learning Awareness Scale sub-dimensions.

Factors		Pearson correlation coefficient				
		Factors				Total
		F1	F2	F3	F4	
F1	R	1	0.714**	0.827**	0.653**	0.939**
	p		0.000	0.000	0.000	0.000
F2	R	0.714**	1	0.760**	0.673**	0.869**
	p	0.000		0.000	0.000	0.000
F3	R	0.827**	0.760**	1	0.670**	0.924**
	p	0.000	0.000		0.000	0.000
F4	R	0.653**	0.673**	0.670**	1	0.795**
	p	0.000	0.000	0.000		0.000
Total	R	0.939**	0.869**	0.924**	0.795**	1
	p	0.000	0.000	0.000	0.000	
	N	900	900	900	900	900

**0.0.01.

TABLE 16 Reliability coefficients of Grammar Learning Awareness Scale final form and sub-dimensions.

Scales and sub-dimensions	Item number	Cronbach's Alpha (α)
Factor1. The Contribution of Grammar to Individual Development	21	0.76
Factor2. The Contribution of Grammar to Language Skills	13	0.76
Factor3. The Contribution of Grammar to Cognitive Functions	13	0.76
Factor4. The Contribution of Grammar to Communication Skills	8	0.78
Grammar Learning Awareness Scale	55	0.83

3. 32–40 score range—determined as a high level of the contribution of grammar to communication skills.

Considering the overall scale, the minimum score that can be obtained from the Grammar Learning Awareness Scale is 55 and the maximum score is 275. The arithmetic mean of the scale was found to be ($\bar{x} = 204$). For scale;

1. 1–133 score range—low level.
2. 134–204 score range—intermediate level.
3. The score range of 205–275 is determined as high-level grammar learning awareness.

Pearson Correlation Coefficient for the sub-dimensions of the scale is given in Table 15.

When the Pearson Correlation Coefficient between the DBPS factors and the total score of the scale was examined, it was found to be at a moderate level between "F1" and "F2" ($r = 0.71$, $p < 0.01$); It is at a high level between "F1" and "F3" ($r = 0.83$, $p < 0.01$), at a medium level between "F1" and "F4" ($r = 0.65$, $p < 0.01$), and at a high level between F1 and the total score of the scale. A high level ($r = 0.94$, $p < 0.01$) relationship was found. There is a high level between "F2" and "F3" ($r = 0.76$, $p < 0.01$), a high level between "F2" and "F4" ($r = 0.67$, $p < 0.01$), and a high level between F2 and the total scale score. A high level ($r = 0.93$, $p < 0.01$) relationship was found. A high level of correlation was found between "F3" and "F4" ($r = 0.67$, $p < 0.01$), and a high level of correlation was found between F3 and the total scale score ($r = 0.92$, $p < 0.01$). A high level of correlation ($r = 0.80$, $p < 0.01$) was found between F4 and the scale total score. This measurement tool, which was developed to determine students' awareness of the reasons for learning grammar in their mother tongue, is expected to represent the same structure with all its factors. The high correlation between the factors is due to the nature of the structure. Reliability analysis for the scale and scale sub-dimensions was conducted again according to the number of factors and items determined after CFA.

Table 16 shows the reliability coefficients for the sub-dimensions of the scale.

When the internal consistency coefficients for the final scale and its sub-dimensions validated by CFA were examined, the Cronbach alpha internal consistency coefficient was $\alpha = 0.76$ for "F1", $\alpha = 0.76$ for "F2", $\alpha = 0.76$ for "F3", $\alpha = 0.78$ for "F4". The overall score and its sub-dimensions' internal consistency coefficient was found to be $= 0.83$. These obtained values show that all four sub-dimensions are quite consistent and reliable. It was concluded that the final form of the scale to be used to measure awareness of grammar learning had a high level of reliability of $\alpha = 0.83$.

As a result of the CFA analysis of the Grammar Learning Awareness Scale with 55 items, it was seen that the model data fit was achieved. The final form of the scale took its final form as four dimensions. When the scale score ranges are examined, high scores indicate high and low scores indicate low grammar learning awareness. It has been verified because of the analyses that the sub-factors of the scale are the components of this structure called grammar learning awareness and that they together form the determined structure. It was concluded that the model and goodness-of-fit indices were at a good level.

5 Discussion

The main purpose of grammar teaching is to develop thinking, understanding, making sense and conveying meaning correctly. Understanding the aim of grammar instruction given for this purpose will not only make learning easier but will also motivate learning. In the literature, there are scales to determine students' grammar attitudes (Ömeroglu and Onan, 2021; Er and Topçuoglu, 2016; Özkaya and Coşkun, 2018; Karasakaloglu, 2018), metalinguistic awareness (Varişoglu, 2018) and language awareness (Yaman, 2011). In the related literature, students' metalinguistic awareness is usually determined by assigning different tasks or the relationships between metalinguistic skills and other language skills are examined. There is no measurement tool that determines students' awareness of why they learn grammar in mother tongue education. This study did not aim to develop a measurement tool to determine students' metalinguistic awareness. In this study, a "Grammar Learning Awareness Scale" with high validity and reliability was developed that can reveal high school students' awareness of learning grammar.

In naming the factors, the purposes/justifications of grammar put forward in the literature (Hudson, 1992 as cited in Aydin, 1997), examining the effect of grammatical awareness (phonological, morphological and syntactic awareness) on comprehension and expression skills (Aslan, 2017; Brimo et al., 2017; Can, 2016; Carlisle, 2000; Deacon and Kieffer, 2017; Francis, 2002; Güldenoğlu et al., 2019; Mahony et al., 2000; Nakatani, 2005; Tyler and Nagy, 1990) and the findings and results of studies that reveal awareness of why grammar is learned (Ekinci Çelikpazu and Atalay, 2021) were taken into consideration. Fifty-five items were noticed to have been gathered, 21 of which fell under Factor 1, 13 under Factor 2, 13 under Factor 3, and 8 under Factor 4. It is possible to make correct determinations to produce valid data and produce possible solutions with valid and reliable measurement tools. It shows that the scale is a reliable measurement tool for measuring grammar learning awareness.

The items in the scale show that Hudson's (1992) justifications for grammar teaching overlap with students' grammar awareness. Hudson (1992, cited in Aydin, 1997) lists the reasons for grammar teaching as follows:

- *Build linguistic self-esteem and self-confidence,*
- *To assist the teaching of the standard language,*
- *Helping to increase students' success,*
- *Helping to learn a foreign language,*
- *Increasing linguistic and cultural tolerance,*
- *To teach scientific method and analytical thinking,*
- *Protecting against language abusers,*
- *Helping to understand language problems,*
- *To further the general knowledge of the language,*
- *Creating awareness of the structure of language and the differences in language use,*
- *To develop thinking skills by analyzing the relationships that make up the structure of the language,*

- *Transforming the instinctive knowledge of the language into conscious knowledge and language use skills.*

It was observed that the sub-dimensions of the scale overlapped with the results of studies examining language awareness in the first language, foreign language or second language, metalinguistic awareness, their effect on other language skills (reading, speaking, writing) or the relationship between them. In line with the expert opinions, the first dimension of the Grammar Learning Awareness Scale was named as "The Contribution of Grammar to Individual Development". The items in this dimension express how grammar can be useful in individual development and life. It emphasizes how grammar can enable learning, organizing, understanding and facilitating life. It also shows that grammar can contribute to developing self-confidence, using language correctly and discovering the beauties of language. The items in this dimension overlap with the positive effects of grammar on the personal development of individuals stated in the literature. "Grammar contributes to the personal development of individuals by affecting the way they express themselves. Correct use of grammar can increase students' self-confidence. Grammar can help students understand different cultures and perspectives and help students develop a sense of belonging to the target language community." (Larsen-Freeman, 2003, p. 63–103). One of the items in this dimension is that learning grammar will facilitate learning a foreign language. There are opinions supporting this item in the literature. Walla (2024) clearly states that having knowledge about the language and exploring one's own language learning improves students' language learning and comprehension skills, and learning by using these linguistic experiences makes learning a foreign language more effective and meaningful.

The second dimension of the scale is named "The Contribution of Grammar to Language Skills". This dimension refers to how grammar improves language skills and language use. The items show how grammar can enable students to use language appropriately and effectively, learn the structure and rules of language, correct mistakes and use language with care. The items in the dimension overlap with the definitions of students' grammar awareness. Because language awareness is a cognitive concept that covers language teaching, language use and communication process (Svalberg, 2007). It requires understanding and analyzing how languages work and how people use language in various contexts. While language use is concerned with the communicative aspect of language, grammar is the understanding/exploration of how the form and structure of language are organized. Students' language awareness can be thought of as exploring language patterns, attitudes about language and the role of language in communication (Gustiani and Irwandi, 2024).

A few of the items in the second dimension also emphasize that grammar can contribute to improving reading, writing and speaking skills and increasing the ability to communicate. There are studies showing that grammatical awareness is significantly related to both reading fluency and reading comprehension performance (Brimo, 2011; Brimo et al., 2017; Cain, 2007; Deacon and Kieffer, 2017; Mokhtari and Thompson, 2006). For example, it has been stated that phonological awareness is at the center of the reading process and is an important skill especially for word decoding acquisition (Güldenoğlu et al., 2019: p. 5). In a study conducted with elementary school students of a bilingual intercultural educational institution (Quispe-Morales, 2022), the effect of developing metalinguistic awareness on improving reading comprehension in Spanish as a second language was confirmed. It was concluded that the development of metalinguistic awareness has significant effects on reading comprehension at the literal, inferential and critical levels in Spanish as a second language in primary school students.

Tyler and Nagy (1990) examined high school students' use of lexical-semantic and syntactic knowledge and reported that students with good reading levels used grammatical knowledge better in words with derivational suffixes than poor readers. Another study on reading comprehension with different grade groups (Liao et al., 2023) showed that morphological awareness was the only consistent predictor of reading comprehension in all grades. The results of the study emphasized the importance of morphological awareness as the most powerful meaning-making metalinguistic skill that can consistently predict Chinese reading comprehension in elementary school children.

The third dimension of the scale is named "The Contribution of Grammar to Cognitive Functions". This dimension refers to how grammar improves thinking and learning skills. The items show how grammar can enable students to use linguistic elements such as stress, pauses and intonation, construct sentences, speak clearly, and recognize spelling mistakes. They also emphasize how grammar can enable students to understand grammatical rules, meanings and relationships between concepts in language, and to use language consciously. Knowledge about why L1 grammar is learned is related to *cognitive academic language proficiency* (CALP) because knowledge about the nature of language, its structure/functioning requires language related to higher order thinking skills such as questioning, predicting, inferring, evaluating, classifying. The different texts used in teaching grammar in the first language present students with the social context and the linguistic context. Through grammatical analysis of these texts, students master "specialized vocabulary and different functions of linguistic forms" (Cummins, 2008). In this way, they become aware of which linguistic structures they can prefer in different communication contexts.

Carter (2003) defines language awareness as a developed consciousness and sensitivity to the different forms and functions of language uses. This definition describes a cognitive process that involves discovering the formal properties of language uses and making and expressing connections between form and function/meaning. It incorporates interrogative, analytical and exploratory thinking skills into grammar teaching, which necessitates the consideration of forms together with their functions. At the same time, language awareness is dynamic and intuitive, enabling students to ask questions about the structure of language, to collect their own linguistic data in settings outside school, and to develop an understanding of how language works as a means of conveying ideas (Larsen-Freeman, 2003; Barjesteh and Vaseghi, 2012). Language awareness activities provide students with different sample experiences to reach grammatical generalizations on their own through activities such as analyzing, comparing, classifying and questioning. In this

way, students actively participate in learning the relationships between the form and function of language use (Sze and Leung, 1998).

The fourth dimension of the scale is named "The Contribution of Grammar to Communication Skills". This dimension refers to how grammar improves the ability to communicate and express oneself. The items show how grammar can help express thoughts and feelings better, express oneself better, communicate accurately and effectively, improve listening skills, and think correctly. According to Vygotsky's Social Interaction Theory, all personal psychological processes begin with social processes shared between people, often between children and adults. The clearest example of this is language. Vygotsky states that language development is shaped through social interaction (Güneş, 2013; Senemoglu, 2020). In line with this theory, it can be said that grammar awareness can be developed by the individual acquiring knowledge about language structures in the process of interaction with his/her social environment and using this knowledge consciously. The items of the scale in this dimension confirm this. Larsen-Freeman (2003) argues that grammatical awareness plays an important role in strengthening neural networks, enriching social interaction and facilitating information processing. In a study that treats language awareness as a socio-cognitive phenomenon that can be meaningfully observed through learners' interaction with language in the classroom (Andersen, 2024), it was concluded that language awareness emerges in a collaborative way, that the different forms of language awareness studied are often interconnected, and that they should be viewed as such in both research and teaching practice.

Grammar forms the basis of language skills such as listening, speaking, reading and writing. There are studies showing that grammar awareness is effective in the development of students' comprehension and expression skills. In listening and speaking, grammar is considered essential to learn the structure of a language, to acquire the ability to produce grammatically acceptable expressions in the language, and therefore plays a crucial role in comprehending and expressing spoken language. In reading, grammar enables students to understand the grammatical relations through which messages are constructed; in writing, it enables students to convey their ideas clearly and to communicate successfully in writing. In the case of vocabulary enrichment, grammar teaches learners how to combine certain signs to form meaningful expressions (Widodo, 2006).

In a study conducted by Batur and Beyret (2015), it was revealed that grammar awareness positively affects writing skills. In the study, it was argued that students with high meta-linguistic awareness were more successful in writing skills. With the content offered by the school curriculum, students try to get to know the language only within the framework of its rules. They act on the assumption that knowledge of the rules of the language will be asked in exams and will not be used elsewhere, and the rules are memorized. This attitude leads them to see language as a static means of communication and prevents them from learning the general knowledge about language, its logic and the way it functions. Language, whether for native speakers or foreign/second language learners, should not be taught with explanations that would lead to the development of attitudes contrary to the nature of language and lead to memorization. All explanations should be in accordance with the nature of the language and the functioning order of its structure. Thanks to language, an individual has the skills to discover himself, the real world, his own world, to recognize, to make sense of, to elaborate, to establish relationships, to create thoughts, to transform into experience, to produce emotions/knowledge and to share with others. Throughout this whole process, one recognizes language with its social and individual aspects, starting with language skills. It is expected that an effective grammar teaching process will not conflict with this feature and will create such a consciousness/awareness of the language in students. Knowing the implicit characteristics of the learners and following them throughout the process will contribute to effective and successful grammar teaching. Determining awareness, which is considered an implicit feature of grammar learning, will also enable correction/improvement of grammar teaching activities. Borg (1994) emphasizes the desirability of developing awareness of learning/teaching processes to improve teaching and develop learner independence (cited in Svalberg, 2007).

6 Implications

Grammar learning awareness is crucial for students to improve their language skills and enhance their academic achievement. The scale is a valid and reliable tool for measuring grammar learning awareness in students. Teachers can utilize classroom activities and strategies to foster grammar learning awareness in students. The scale can contribute to theoretical frameworks related to grammar teaching and learning. For example, findings from the scale could underscore the importance of student-centered approaches in grammar teaching. The scale can encourage further research on grammar learning awareness. Studies using this scale can be conducted to enhance students' motivation toward grammar learning and promote their active participation in learning processes. The scale can help teachers understand their students' grammar learning awareness and adjust their teaching strategies accordingly.

7 Limitations and recommendations

The "Grammar Learning Awareness Scale" developed in this study was designed to measure grammar learning awareness in high school students. The scale may not cover all aspects of grammar learning awareness. It may be useful to develop additional scales focusing on different grammar topics or learning styles. The sample of the study consisted of 900 students from six different high schools in Turkey. Therefore, the generalizability of the study findings may be limited. Since the scale was developed in Turkish and administered to students in Turkey, it may contain cultural biases. The expressions and concepts used in the scale may not have the same meaning for students from different cultures. Future studies can examine the cross-cultural validity of the scale by applying it to students from different cultural backgrounds. The validity and reliability of the scale was tested only on high school students in Turkey. The validity and reliability of the scale can be

tested again on students from different age groups. In addition, it may be useful to conduct studies with students from different countries to evaluate its cross-cultural validity. Training programs and interventions can be designed and evaluated to increase students' awareness of grammar learning. The relationship between grammar learning awareness and other variables (e.g., academic achievement, motivation, learning styles) can be investigated. Qualitative methods can be used to gain a deeper understanding of students' awareness of grammar learning. In-service training programs can be organized to increase teachers' knowledge on grammar learning awareness. In addition, the limitations of the principal components analysis used in the scale development phase are acknowledged. It can be suggested to be used as an alternative method for future scale development studies.

8 Conclusion

In this study, the Grammar Learning Awareness Scale was developed for high school students. It was seen that the factors "Contribution of Grammar to Individual Development," "Contribution of Grammar to Language Skills," "Contribution of Grammar to Cognitive Functions" and "Contribution of Grammar to Communication Skills" formed the structure of Grammar Learning Awareness. The scale provides a comprehensive perspective on the elements required for grammar awareness in today's educational environment. Determining the cut-off score for each sub-factor in the scale will help researchers in their studies. Determining the cut-off score for each sub-factor of the developed Grammar Learning Awareness Scale allows researchers to make valid and reliable comparisons between factors and classify data according to a specified criterion.

The results of the study reveal the validity and reliability of the developed scale. However, it should be noted that other techniques (principal axis factor analysis, maximum likelihood analysis, image factor analysis, unweighted least squares analysis, unweighted least squares analysis, generalized least squares analysis, alpha analysis) can be preferred in factor analysis studies instead of principal component analysis, which is accepted as the most common method for estimating pattern coefficients and factor extraction in factor analysis studies and used in this study. However, the study revealed that there is a need for studies on grammar learning awareness in the literature. In addition, it is seen that the scale/scales should be increased within the framework of the measured feature. If the developed grammar learning awareness scale will be used by researchers, it is seen that the scale has the power to reveal many skills related to grammar learning awareness.

In conclusion, the developed scale provides an important basis for the measurement and evaluation of grammar learning awareness competences of high school students. In addition, it provides a valid and reliable measurement tool to the literature. It is seen that the contribution of grammar learning awareness to individual development, language skills, cognitive functions and communication skills can be measured by this scale. It is predicted that the scale will play an effective role in identifying students who integrate cognitive processes related to learning by using language actively, consciously and correctly. In addition, it is thought that the scale includes indicators that will predict students "academic achievements and linguistic skills related to grammar, and teachers" evaluations of these data will contribute to the educational process.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Recep Tayyip Erdoğan University Social and Human Sciences Ethics Committee No: 2021/75. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

FT: Data curation, Formal analysis, Funding acquisition, Methodology, Validation, Writing – original draft, Writing – review & editing. EA: Conceptualization, Data curation, Funding acquisition, Investigation, Resources, Writing – original draft, Writing – review & editing. EE: Conceptualization, Data curation, Funding acquisition, Investigation, Resources, Writing – original draft, Writing – review & editing.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

TABLE A1 Grammar Learning Awareness Scale.

Item	Statements	Points				
1	Because of what I've learned about grammar, I can now correct other people's grammatical errors.	1	2	3	4	5
2	I now understand how the grammatical structure of the language is formed thanks to what I have learnt about grammar.					
3	I adhere to the grammar rules of the language because of what I have learnt about them.					
4	I use language more effectively when speaking.					
5	I use language more effectively when writing.					
6	I learn the rules of the language.					
7	I utilize the language more carefully when speaking now that I know more about grammar.					
8	I utilize the language more carefully when writing now that I know more about grammar.					
9	I like my language thanks to what I learned about grammar.					
10	I can better understand the text I listen to.					
11	I better understand the text I read.					
12	I communicate with people in a healthy way.					
13	I can describe my feelings better.					
14	I can express my thoughts better.					
15	I make sense of my own existence thanks to what I have learned about grammar.					
16	I pass the course easily thanks to what I learned about grammar.					
17	I use what I learned about grammar in my daily life.					
18	I learn grammar because it is the basis of language.					
19	I will do well in other lessons because of what I have learnt about grammar.					
20	I can express myself better.					
21	I can generate correct thinking.					
22	I express my thoughts correctly.					
23	I express my thoughts effectively.					
25	I get the world right.					
26	I understand the deep structure of sentences.					
27	I learn grammar to eliminate misunderstanding.					
28	I learn our culture better.					
29	I interpret the relationships between concepts more accurately.					
30	My language consciousness is formed.					
31	What I learn about grammar makes me realize the beauty of the language.					
32	Knowing the rules of the language improves my awareness of taking responsibility.					
33	I empathize with others thanks to what I have learned about grammar.					
34	I pronounce words in the language correctly.					
35	I learn that every form in the language has a meaning.					
36	I read with attention to emphasis, pause and intonation.					
37	I speak with attention to emphasis, pause, and intonation.					
38	I talk clearly now because of what I've learnt about grammar.					
39	I learn grammar to improve myself.					
40	I use the language appropriately, which helps the language develop because of what I learnt about grammar.					

(Continued)

TABLE A1 (Continued)

Item	Statements	Points				
41	Grammar helps me to establish a part-whole relationship.					
42	I now understand the grammatical errors I made while speaking because of what I learnt about it.					
43	I now understand the grammatical errors I made while writing because of what I learnt about it.					
44	I can construct sentences because of what I have learnt about grammar.					
45	I improve myself thanks to what I learn about grammar.					
46	I am socially accepted thanks to what I have learned about grammar.					
47	Thanks to what I learned about grammar, I know my language.					
48	I feel confident thanks to what I have learned about grammar.					
49	I learn life better thanks to what I learn about grammar.					
50	Learning grammar makes my life easier.					
51	I organize my life thanks to what I learn about grammar.					
52	I use language consciously.					
53	I think creatively thanks to what I have learned about grammar.					
54	I know myself thanks to what I have learned about grammar.					
55	What I learn about the structure of the language makes it easier for me to learn a foreign language.					