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Higher-order thinking skills from teachers' perspectives in 21st-century Türkiye: Skill priorities, student profiles, and developmental factors

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Abstract: This study aims to identify teachers' perceptions of students' higher-order thinking (H-OT) skills, the characteristics of students who demonstrate these skills, and the factors that foster their development. It also examines whether teachers' rankings vary by sex, professional seniority, and school type. A sequential exploratory mixed-methods design was employed. In the qualitative phase, semi-structured interviews informed the development of a ranking-judgment scale. In the quantitative phase, data were collected from 405 teachers working in Türkiye and analyzed using the rank-order judgment scaling method. The findings indicated that creative thinking was ranked as the most important H-OT skill, followed by critical thinking, metacognitive thinking, problem-solving, and analytical thinking. Teachers described students with H-OT skills mainly as multidimensional thinkers, inquisitive, self-confident, and articulate. Parental attitudes, student personality, and social environment emerged as the most influential developmental factors. Group comparisons showed that teachers' views differed only in selected skills, student profiles, and developmental factors. These findings may inform classroom practices, teacher education, and policy efforts aimed at promoting H-OT skills through inquiry-based learning, school–family cooperation, and enriched learning environments.

INTRODUCTION

The aims of education are continuously revised and reshaped in response to the conditions of the time. While earlier educational systems primarily emphasized the acquisition of foundational cognitive abilities, curricular priorities have increasingly shifted since the early 2000s toward fostering higher-order thinking (H-OT) skills (Olukçu & Yıldız, 2022; Ünveren-Kapanadze, 2019). Following a long-standing tradition of knowledge-oriented educational practices, contemporary approaches have increasingly shifted toward frameworks grounded in H-OT skills (Haladyna, 1997). In the twenty-first century, it is widely emphasized that individuals are expected to possess higher-order cognitive skills rather than merely basic cognitive abilities (Altıntaş, 2022; Mutrofin *et al*., 2016).

Despite extensive discussion in the literature, H-OT skills remain a concept for which no single, universally accepted definition exists. These skills are commonly described as cognitive

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processes that extend beyond simple information recall (de Bono, 1987) and as abilities that are difficult to define precisely but relatively easy to recognize when demonstrated in practice (Resnick, 1987). From another perspective, H-OT skills are conceptualized as the competencies required to solve real-life problems characterized by uncertainty and complexity (Kitchener & Fischer, 1990).

H-OT skills have been conceptualized and classified in various ways by researchers. For example, Brown (2004) argues that H-OT skills are fundamentally derived from Bloom's taxonomy (1956). Gagne (1977) classified thinking skills as signal learning, concept learning, rule learning, and problem solving, identifying problem solving as a H-OT skill within this framework. In Haladyna's (1997) classification, thinking skills are categorized as comprehension, learning rules and procedures, critical thinking, and creativity, with critical thinking and creativity explicitly identified as H-OT skills.

In the literature, H-OT skills—also frequently referred to as twenty-first-century skills—are exemplified by abilities such as critical thinking (Chance, 1986; Royalty, 1995), creative thinking (Wang, 2012; Wu *et al*., 2014), problem solving (D'Zurilla & Goldfried, 1971; Kesicioğlu, 2015; Yıldız *et al*., 2019), analytical thinking (Akkuş-Çakır & Senemoğlu, 2016; Montaku *et al*., 2012; Özdemir, 2020), analogical thinking (Öz, 2023; Sarıkaya, 2019), reflective thinking (Dewey, 1910; Kızılkaya & Aşkar, 2009; Kruger & Van der Merwe, 2012), lateral thinking (Fisher, 2010; Şahin-Taşkın & Esen-Aygün, 2022; Ünveren-Kapanadze, 2019), cognitive flexibility (Karataş, 2024; Koç & Mehdiyev, 2022; Spiro *et al*., 2003), reasoning (Dökme, 2019; Kıraç & Elaldı, 2023; Leighton & Sternberg, 2004), and metacognitive thinking (Schraw & Moshman, 1995; VanderStoep & Pintrich, 2007). Research indicates that H-OT skills contribute significantly to individuals' ability to solve problems they encounter (Duyar, 2005) and that students who possess these skills are likely to demonstrate higher levels of academic achievement (Tanujaya *et al*., 2017).

In this context, countries have implemented various programs and large-scale assessment initiatives to evaluate and promote H-OT skills. Examples include the Collegiate Learning Assessment in the United States, which examines university students' "critical thinking, analytical reasoning, and problem-solving skills"; "Global Perspectives and Independent Research" in the United Kingdom, which focuses on students' research, "analytical thinking, and communication skills"; and the OECD's "Assessment of Higher Education Learning Outcomes", which enables cross-national comparisons of "critical thinking, analytical reasoning, and problem-solving" skills in higher education institutions (Çakır, 2013).

Countries allocate substantial financial resources, human capital, and time to national initiatives aimed at developing students' thinking skills. Alongside national evaluation frameworks, student achievement is frequently analyzed through international large-scale comparative assessments. Prominent examples include PISA and TIMSS, which are designed to measure both basic academic competencies and higher-order cognitive abilities. Comparisons based on international achievement profiles increasingly exert pressure on countries to emphasize the development of H-OT skills within their educational curricula, philosophies, and visions (Arcagök, 2021; Boyraz, 2024; Shimizu & Vithal, 2023; Tajudin & Chinnappan, 2016).

International large-scale student assessments collect data extending beyond student achievement, with questionnaires capturing a wide range of instructional and learning-related factors. These questionnaires examine teachers' and students' perceptions, students' attitudes toward education, their experienced challenges and expectations, and their affective orientations toward school and teachers. As the primary agents of the educational process, teachers' and students' perspectives are of critical importance for identifying areas in need of improvement and enhancement within educational systems.

Teachers interact with students continuously in classroom settings and are therefore well-positioned to observe students' cognitive characteristics closely. For this reason, teachers'

perspectives are considered a valuable source of information for efforts aimed at developing students' thinking skills. Identifying the skills that teachers recognize as H-OT skills and assessing how these skills are valued from teachers' perspectives may contribute to the advancement of a country's national educational vision.

In the Turkish context, this importance has become even more pronounced with the Turkish Century Education Model (TCEM), which highlights H-OT as a central component of the current national education vision. The TCEM explicitly places H-OT within the framework of conceptual skills and defines decision-making, problem-solving, and critical thinking as fundamental H-OT skills (Ministry of National Education, 2025). In parallel, recent curriculum and textbook-focused studies have shown that H-OT skills are becoming increasingly visible in curriculum documents and teaching materials (Kara-Özkan, 2025; Sarıkaya *et al*., 2023). Similarly, teacher-focused studies show that teachers acknowledge the importance of H-OT and twenty-first-century skills (Karataş, 2024; Metin *et al*., 2023). Other recent national studies have generally focused on teachers' twenty-first-century skills competencies, graduate research trends, scale adaptation, assessment tools, or technology-supported instruction practices (Çetin & Arslan, 2025; Gürlük *et al*., 2025; Kaya *et al*., 2024; Özer & Tekin-Bozkurt, 2024). However, these studies do not examine in an integrated and comparative manner how teachers prioritize H-OT skills, the characteristics of students with these skills, and the factors influencing their development. Taken together, these recent national developments and empirical findings highlight both the timeliness of the present study and the need for a theoretically grounded investigation of teachers' perspectives on H-OT skills. Accordingly, the present study draws upon Bloom's Revised Cognitive Taxonomy (Anderson *et al*., 2001), Metacognition Theory (Flavell, 1979; Schraw & Moshman, 1995), and Vygotsky's Sociocultural Theory (Vygotsky, 1978) to examine students' H-OT skills from teachers' perspectives. In this respect, the study's findings may provide a basis for future research aimed at developing H-OT skills and offer important implications for practitioners, researchers, and policymakers.

The purpose of the present study is to identify, from a teacher's perspective, (a) students' H-OT skills, (b) the characteristics of students who possess these skills, and (c) the factors influencing the development of H-OT skills, as well as to determine the relative importance of each. In addition, the study examines whether teachers' perceptions differ according to sex, professional seniority, and the school type. To this end, the following research questions were addressed:

1.a. What is the relative importance ranking of H-OT skills according to teachers' perspectives and characteristics?

1.b. Do teachers' rankings of H-OT skills differ according to sex, professional seniority, and school type?

2.a. What is the relative importance ranking of the characteristics of students with H-OT skills according to teachers' perspectives and characteristics?

2.b. Do teachers' rankings of characteristics of students with H-OT skills differ according to gender, professional seniority, and school type?

3.a. What is the relative importance ranking of the factors that foster the development of H-OT skills according to teachers' perspectives and characteristics?

3.b. Do teachers' rankings of the factors that foster the development of H-OT skills differ according to gender, professional seniority, and school type?

METHOD

Research Design

This study adopted a sequential exploratory (two-phase) mixed-methods design because the quantitative phase was intended to be developed directly from the qualitative findings. In the first, exploratory phase, semi-structured interviews were conducted with teachers to identify

the H-OT skills they considered important, the characteristics of students who possess these skills, and the factors perceived to influence their development. The qualitative data were analyzed through content analysis, and the most frequently identified categories in each domain were used to construct the three sections of the Ranking Judgments Scale Form. Thus, the qualitative phase provided the empirical basis for determining the content of the quantitative instrument.

In the second, quantitative phase, the Ranking Judgments Scale Form was administered to a larger teacher sample to determine the relative importance of the categories generated in the qualitative phase. The design was therefore sequential and exploratory: qualitative findings informed the development of the quantitative instrument, and the quantitative phase extended these findings by ranking the relative importance of the identified skills, student characteristics, and developmental factors. Research questions 1.a, 2.a, and 3.a were addressed through scaling by ranking judgments, whereas research questions 1.b, 2.b, and 3.b were addressed through group comparison analyses based on teachers' sex, professional seniority, and school type.

Population and Sample

The research sample consisted of 405 teachers working in state schools under the authority of the Turkish Ministry of National Education across five metropolitan areas in Türkiye: Istanbul, Ankara, Denizli, Kayseri, and Gaziantep. Convenience sampling was used to select the participants. These metropolitan areas were selected to increase contextual diversity in the quantitative phase rather than to construct a statistically representative regional sample. Because the cities were geographically distant from one another, data collection was coordinated through accessible school networks and professional contacts in each metropolitan area. Teachers working at different educational levels were invited to participate voluntarily, and the same Ranking Judgments Scale Form and ranking instructions were used across all participating teachers. Thus, the implementation of convenience sampling was based on the accessibility and voluntary participation of teachers in the selected metropolitan areas, while also aiming to include participants from different school types and professional backgrounds.

Of the 405 participants, 237 were female (58.5%), and 168 were male (41.5%). In terms of professional seniority, 185 teachers had up to 5 years of experience (45.7%), 107 had 6–10 years of experience (26.4%), 60 had 11–15 years of experience (14.8%), and 53 had 16 years or more of experience (13.1%). Regarding school type, 49 participants worked at the preschool level (12.1%), 74 at the primary school level (18.3%), 149 at the middle school level (32.8%), and 133 at the high school level (36.8%).

Data Collection Instruments

Two data collection instruments were developed by the researchers to scale, using ranking judgments based on teachers' perceptions: (a) H-OT skills, (b) characteristics of students who possess H-OT skills, and (c) factors influencing the development of H-OT skills.

Semi-structured interview form

The researchers developed the Semi-Structured Interview Form (S-SIF). It included open-ended questions designed to identify, from a teacher's perspective, the most important H-OT skills in education, the characteristics of students who demonstrate these skills, and the factors perceived to influence the development of H-OT skills. Using criterion-based purposive sampling, the interview form was administered to 24 teachers. The criteria used in selecting interview participants were sex, professional seniority, and teaching at different educational levels: "preschool, primary school, middle school, and high school". Of the interviewed teachers, 12 (50.00%) were female, and 12 were male. Eight teachers (33.33%) had 10 years or less of experience, eight (33.33%) had 11–20 years, and eight (33.33%) had 21 years or more. Six teachers (three female and three male) from each educational level participated in the interviews.

Content analysis revealed a range of H-OT skills identified by the participants. The most frequently identified skills were critical thinking (*f* = 22), analytical thinking (*f* = 20), creative thinking (*f* = 19), problem solving (*f* = 16), metacognitive thinking (*f* = 13), reasoning (*f* = 12), and knowledge transfer (*f* = 10). Less frequently mentioned skills included reflective thinking (*f* = 8), analogical thinking (*f* = 7), lateral thinking (*f* = 7), inquiry (*f* = 4), communication (*f* = 4), generalization (*f* = 4), planning (*f* = 4), and logical reasoning (*f* = 4). Skills with lower frequencies were coping with uncertainty (*f* = 3), systematic thinking (*f* = 3), decision making (*f* = 2), imagination (*f* = 2), defending one's opinion (*f* = 1), making comparisons (*f* = 1), and stress management (*f* = 1).

The ten H-OT skills with the highest frequencies were, respectively: "creative thinking, critical thinking, analytical thinking, problem solving, metacognitive thinking, reasoning, knowledge transfer, reflective thinking, analogical thinking, and lateral thinking". These skills were included in Section 1 of the Ranking Judgments Scale Form.

Based on the content analysis, the student characteristics most frequently observed by teachers in students who possess H-OT skills were being inquisitive (*f* = 21), thinking multidimensionally (*f* = 19), being articulate (*f* = 16), being open to innovation (*f* = 14), being productive (*f* = 13), being self-confident (*f* = 11), being original (*f* = 10), and being persistent (*f* = 10). Other relatively frequent characteristics included self-regulation (*f* = 9), being solution-oriented (f = 9), talkativeness (*f* = 6), and meticulousness (*f* = 5). Less frequently mentioned characteristics were being emotional, closed to communication, open to communication, cheerful, disorganized, having strong peer relationships, being shy, having self-esteem, being result-oriented, highly motivated, angry, respectful, willing to learn, and rational. The ten characteristics with the highest frequencies were inquisitive, multidimensional thinker, articulate, open to innovation, productive, self-confident, original, persistent, self-regulated, and solution-oriented. These characteristics were included in Section 2 of the Ranking Judgments Scale Form.

The content analysis revealed that the factors most frequently identified as influencing the development of H-OT skills were mother's education (*f* = 22), household income (*f* = 21), social environment (*f* = 19), student personality (*f* = 17), father's education (*f* = 14), teacher (*f* = 13), parental relationship (*f* = 13), and parental attitudes (*f* = 11). Other factors mentioned included age (*f* = 9), gender (*f* = 8), mother's occupation (*f* = 7), birth order (*f* = 6), number of siblings, father's occupation, and home learning opportunities (*f* = 5 each). Factors with lower frequencies were physical resources, social facilities, number of books read, number of friends, preschool education, the place where most of life is spent, allowance, primary caregiver in infancy, and the presence of a teacher in the family.

The ten factors with the highest frequencies were mother's education, household income, social environment, student personality, father's education, teacher, parental relationship, parental attitudes, age, and gender. These factors were included in Section 3 of the Ranking Judgments Scale Form.

Ranking judgments scale form

The researchers developed the Ranking Judgments Scale Form (RJSF), which consists of three sections. The RJSF was developed using evidence gathered through semi-structured interviews and includes:

- **Section 1.** H-OT skills: "critical thinking, analytical thinking, creative thinking, problem solving, metacognitive thinking, reasoning, ability to transfer knowledge, reflective thinking, analogical reasoning, and lateral thinking."
- **Section 2.** Characteristics of students who possess H-OT skills: "inquisitive, multidimensional thinker, articulate, open to innovation, productive, self-confident, original, persistent, self-regulated, and solution-oriented."

- **Section 3.** Factors influencing the development of H-OT skills: "mother's education, household income, social environment, student personality, father's education, teacher, parental relationship, parental attitudes, age, and gender."

The RJSF was developed as an original instrument for the present study. Its content was derived from the qualitative phase, in which teachers' responses were analyzed through content analysis. Based on the frequency distributions obtained from the qualitative findings, the ten most frequently identified categories in each domain were selected and included in the corresponding sections of the RJSF: H-OT skills, characteristics of students with H-OT skills, and factors influencing the development of H-OT skills. Limiting each section to ten items was based on the view that cognitive load and visual scanning demands increase as the number of alternatives grows; accordingly, the literature suggests keeping the number of options at or below ten to reduce respondent burden (Alreck & Settle, 2004; Dillman, 2000). To provide evidence for content validity, the draft form was reviewed by three field experts using a four-point relevance scale: 1 = not related to the relevant construct, 2 = partially related, 3 = highly related, and 4 = definitely related. Based on the expert ratings, the content validity index (CVI) values were calculated as .93 for the H-OT skills section, .90 for the student characteristics section, and .87 for the factors influencing the development of H-OT skills section. These values indicated that the selected categories had adequate content relevance and representativeness for the study.

Before administration, the form was also reviewed in terms of clarity and comprehensibility. In each section, teachers were asked to rank the presented skills, characteristics, or factors relative to one another, assigning a value of "1" to the most important and "10" to the least important item. To examine the degree of agreement among the 405 teachers' rank-order judgments, Kendall's coefficient of concordance was calculated separately for the three sections of the form. The results indicated statistically significant concordance for H-OT skills, Kendall's $W = .110$, $\chi^2(9) = 399.42$, $p < .001$; student characteristics associated with H-OT skills, Kendall's $W = .062$, $\chi^2(9) = 225.46$, $p < .001$; and factors influencing the development of H-OT skills, Kendall's $W = .181$, $\chi^2(9) = 659.50$, $p < .001$. These findings show that teachers' rankings were not random and that there was a statistically significant level of agreement across all three sections of the RJSF. However, the magnitude of Kendall's W values suggests that the level of concordance was low to low-moderate, indicating that teachers shared a general tendency in their rankings while also reflecting variation in their individual judgments.

Data Analysis

Data analysis was conducted in two stages corresponding to the two data collection instruments. Semi-structured interview data were analyzed qualitatively, with frequencies employed to present the results. Data obtained from the Ranking Judgments Scale Form were analyzed using the scaling by ranking judgments method (Turgut & Baykul, 1992). This method was selected because the purpose of the quantitative phase was not to measure the absolute level of each skill, characteristic, or factor, but to determine their relative importance based on teachers' rank-order judgments. Since participants were asked to compare and order a fixed set of alternatives rather than rate each item independently, scaling by ranking judgments was considered appropriate for transforming ordinal rank data into interpretable scale values. Frequency values for each skill, characteristic, and factor were calculated, and frequency matrices were constructed. Column totals of this matrix were summed and divided by N^2 to obtain the proportion matrix (P). Corresponding standard normal deviate (Z) values for each proportion were then determined to construct the unit normal deviation matrix (Turgut & Baykul, 1992). Finally, the mean Z values across columns were calculated to obtain scale values (Sj). The origin of the scale was shifted to the smallest mean Z value by adding its absolute value to all scale values if the smallest value was negative, or subtracting it from all values if positive.

Standard errors of the scale values were estimated using a bootstrap procedure with 5,000 resamples. In each bootstrap sample, the scale values were recalculated using the same procedure, and the standard deviation of the resulting bootstrap scale values was reported as the bootstrap standard error. The magnitude of bootstrap standard errors was considered when evaluating subtle differences between factor rankings. If skills with close scale values had large standard errors, they were interpreted as descriptive rankings rather than sharply separated rankings. Group differences were tested not on the derived scale values, but on the raw ranking scores assigned by the participants for each characteristic. Mann-Whitney U tests were used for two-group comparisons by sex, whereas Kruskal-Wallis H tests were used for seniority and institution/school type variables with more than two groups. When the Kruskal-Wallis H test was significant, pairwise Mann-Whitney U tests were conducted to identify the source of the difference. In between-group comparisons, pairwise comparisons conducted following a significant omnibus test were evaluated using the Holm correction to control for multiple comparison error. The significance level was set at .05 for all tests. Lower raw ranking scores indicated that the corresponding characteristic or skill was assigned greater importance.

RESULTS

The results are organized and reported below following the sequence of the study's sub-research questions.

Teachers' Rankings of H-OT Skills

The overall ranking of H-OT skills from teachers' perspectives is presented in Table 1(a), where scale values are reported together with bootstrap standard errors. Creative thinking emerged as the most important H-OT skill (0.838, *SE* = 0.039), followed by critical thinking (0.619, *SE* = 0.035), metacognitive thinking (0.571, *SE* = 0.038), problem solving (0.567, *SE* = 0.034), analytical thinking (0.540, *SE* = 0.037), reasoning (0.403, *SE* = 0.036), knowledge transfer (0.272, *SE* = 0.036), lateral thinking (0.242, *SE* = 0.036), reflective thinking (0.064, *SE* = 0.036), and analogical thinking (0.000, *SE* = 0.039), respectively. The bootstrap standard errors were relatively small at all sample levels; therefore, the overall pattern appears stable.

The rank-order scale values across participant characteristics are presented in Table 1(b-d). Across sex, seniority, and school type, creative thinking consistently ranked first, indicating that this skill was perceived as the most prominent H-OT skill across all examined subgroups. By sex (Table 1b), creative thinking occupied the highest rank for both female (0.712, *SE* = 0.050) and male teachers (1.036, *SE* = 0.063), whereas analogical thinking was ranked lowest in both groups. The subsequent rankings differed by sex: female teachers ranked metacognitive thinking and critical thinking second and third, respectively, while male teachers ranked problem-solving and analytical thinking second and third.

Across professional seniority groups (Table 1c), creative thinking was again the highest-ranked H-OT skill. The second-ranked skill was metacognitive thinking among teachers with up to 5 years and 6-10 years of experience, whereas critical thinking ranked second among teachers with 11-15 years of experience and those with 16 years or more.

Table 1. *Scale values and bootstrap standard errors of H-OT skills by participant characteristics.*

Characteristics	Group	*n*	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
			CeT	CiT	MT	PS	AaT	R	KT	LT	RT	AoT
(a) General	All	405	0.838	0.619	0.571	0.567	0.540	0.403	0.272	0.242	0.064	0.000
			(0.039)	(0.035)	(0.038)	(0.034)	(0.037)	(0.036)	(0.036)	(0.036)	(0.036)	(0.039)
			CeT	MT	CiT	PS	AaT	R	KT	LT	RT	AoT
(b) Sex	Female	237	0.712	0.591	0.547	0.422	0.385	0.373	0.278	0.157	0.048	0.000
			(0.050)	(0.051)	(0.044)	(0.043)	(0.049)	(0.045)	(0.046)	(0.046)	(0.046)	(0.051)
			CeT	PS	AaT	CiT	MT	R	LT	KT	RT	AoT
	Male	168	1.036	0.790	0.776	0.733	0.553	0.455	0.371	0.269	0.089	0.000
			(0.063)	(0.055)	(0.056)	(0.053)	(0.057)	(0.057)	(0.056)	(0.057)	(0.055)	(0.060)
			CeT	MT	CiT	PS	AaT	R	KT	LT	RT	AoT
(c) Seniority	Up to 5 years	185	0.699	0.563	0.561	0.463	0.426	0.339	0.260	0.197	0.118	0.000
			(0.056)	(0.059)	(0.050)	(0.048)	(0.056)	(0.052)	(0.055)	(0.052)	(0.051)	(0.059)
			CeT	MT	AaT	PS	CiT	R	KT	LT	RT	AoT
	6-10 years	107	1.225	0.876	0.732	0.727	0.691	0.552	0.383	0.318	0.058	0.000
			(0.080)	(0.078)	(0.073)	(0.071)	(0.066)	(0.066)	(0.069)	(0.073)	(0.074)	(0.074)
			CeT	CiT	PS	AaT	R	KT	MT	LT	RT	AoT
	11-15 years	60	0.734	0.600	0.557	0.501	0.425	0.333	0.331	0.204	0.018	0.000
			(0.105)	(0.086)	(0.092)	(0.095)	(0.100)	(0.089)	(0.091)	(0.100)	(0.102)	(0.101)
			CeT	CiT	PS	AaT	R	MT	LT	KT	AoT	RT
	16 years or more	53	0.852	0.828	0.755	0.723	0.421	0.402	0.391	0.127	0.086	0.000
			(0.112)	(0.108)	(0.102)	(0.110)	(0.099)	(0.099)	(0.103)	(0.104)	(0.106)	(0.092)
			CeT	R	PS	MT	CiT	AaT	KT	LT	RT	AoT
(d) School type	Preschool	49	0.827	0.615	0.412	0.387	0.284	0.227	0.118	0.103	0.008	0.000
			(0.136)	(0.113)	(0.102)	(0.094)	(0.103)	(0.126)	(0.096)	(0.096)	(0.100)	(0.116)
			CeT	CiT	AaT	MT	PS	KT	R	LT	AoT	RT
	Primary school	74	0.842	0.759	0.659	0.612	0.528	0.440	0.413	0.242	0.159	0.000
			(0.087)	(0.088)	(0.090)	(0.088)	(0.089)	(0.082)	(0.075)	(0.087)	(0.095)	(0.085)
			CeT	PS	CiT	AaT	MT	R	LT	KT	RT	AoT
	Middle school	149	0.948	0.777	0.750	0.737	0.646	0.458	0.337	0.275	0.059	0.000
			(0.066)	(0.054)	(0.057)	(0.061)	(0.065)	(0.058)	(0.061)	(0.061)	(0.061)	(0.065)
			CeT	MT	CiT	PS	AaT	R	KT	LT	RT	AoT
	High school	133	0.828	0.638	0.633	0.523	0.479	0.364	0.330	0.286	0.211	0.000
			(0.066)	(0.072)	(0.057)	(0.059)	(0.064)	(0.064)	(0.065)	(0.062)	(0.061)	(0.067)

Note. AaT: Analytical thinking; AoT: Analogical thinking; CeT: Creative thinking; CiT: Critical thinking; KT: Knowledge transfer; LT: Lateral thinking; MT: Metacognitive thinking; PS: Problem-solving; R: Reasoning; RT: Reflective thinking.

Table 2. *Group differences in raw ranking scores according to sex, seniority, and school type.*

H-OT skill	*p* (Sex)	Significant difference	*p* (Seniority)	Significant difference	*p* (School type)	Significant difference
CeT	.046	Male < Female	.015	6-10 years < Up to 5 years (*p*_adj = 0.014)	.395	—
CiT	.667	—	.232	—	.098	—
MT	.009	Female < Male	.003	6-10 years < 11-15 years (*p*_adj = 0.021); 6-10 years < 16 years or more (*p*_adj = 0.015)	.767	—
PS	.003	Male < Female	.331	—	.103	—
AaT	.004	Male < Female	.339	—	.060	—
R	.315	—	.859	—	.007	Preschool < Primary school (*p*_adj = 0.008); Preschool < Middle school (*p*_adj = 0.010); Preschool < High school (*p*_adj = 0.009)
KT	.029	Female < Male	.148	—	.238	—
LT	.460	—	.639	—	.891	—
RT	.239	—	.032	Up to 5 years < 6-10 years (*p*_adj = 0.028)	.036	Omnibus significant; no significant pairwise difference after Holm correction
AoT	.139	—	.378	—	.311	—

Note. p values are based on raw ranking scores, not the computed scale values. Sex was tested with Mann-Whitney U; seniority and school type were tested with Kruskal-Wallis H. Significant pairwise differences are Holm-adjusted. The sign '<' denotes the group with the lower mean rank; because 1 = highest importance and 10 = lowest importance, the group on the left assigned higher importance to that skill.

Third-ranked skills varied by seniority: critical thinking for teachers with up to 5 years of experience, analytical thinking for those with 6-10 years of experience, and problem-solving for teachers in all other seniority groups at the lower end of the ranking, analogical thinking was ranked lowest among teachers with up to 15 years' experience, whereas reflective thinking was ranked lowest among teachers with 16 years or more.

Across school types (Table 1d), creative thinking also ranked first in each subgroup. The second-ranked skill varied by school type: reasoning among preschool teachers, critical thinking among primary school teachers, problem-solving among middle school teachers, and metacognitive thinking among high school teachers, closely followed by critical thinking. Regarding the lowest ranks, analogical thinking was ranked lowest among preschool, middle school, and high school teachers, whereas reflective thinking was ranked lowest among primary school teachers.

Group Differences in H-OT Skill Rankings

Table 2 presents group differences in raw ranking scores for H-OT skills by sex, professional seniority, and school type. Since lower raw ranking scores indicate higher perceived importance, significant differences were interpreted accordingly. By sex, significant differences were found for creative thinking, metacognitive thinking, problem-solving, analytical thinking, and knowledge transfer. Male teachers assigned higher importance to creative thinking, problem-solving, and analytical thinking, whereas female teachers assigned higher importance to metacognitive thinking and knowledge transfer.

Professional seniority was associated with significant differences in creative thinking, metacognitive thinking, and reflective thinking. Teachers with 6-10 years of experience assigned higher importance to creative thinking than those with up to 5 years of experience. The same group also assigned higher importance to metacognitive thinking than teachers with 11-15 years and 16 years or more of experience. In contrast, teachers with up to 5 years of experience assigned higher importance to reflective thinking than those with 6-10 years of experience. Regarding school type, reasoning differed significantly across groups.

Preschool teachers assigned higher importance to reasoning than primary, middle, and high school teachers. The results suggest that sex and seniority differentiated teachers' rankings for selected H-OT skills, whereas school type showed a more limited pattern, mainly for reasoning.

Teachers' Rankings of Student Characteristics Associated with H-OT Skills

The ranking of student characteristics associated with H-OT skills is presented in Table 3(a), where scale values are reported together with bootstrap standard errors. As shown in Table 3(a), multidimensional thinking was ranked as the most important characteristic of students with H-OT skills (0.494, SE = 0.052), closely followed by inquisitiveness (0.484, SE = 0.053) and self-confidence (0.456, SE = 0.048). These characteristics were followed by articulateness, productivity, originality, solution-orientedness, openness to innovation, persistence, and self-regulation, respectively. The close scale values among the three highest-ranked characteristics suggest that teachers perceived multidimensional thinking, inquisitiveness, and self-confidence as similarly central characteristics of students with H-OT skills.

The ranking of student characteristics related to H-OT skills across teacher characteristics is presented in Table 3(b-d). By sex, female teachers ranked self-confidence, inquisitiveness, and multidimensional thinking as the three most important characteristics, whereas male teachers ranked multidimensional thinking, inquisitiveness, and self-confidence. Thus, although the order differed slightly between female and male teachers, the same three characteristics occupied the highest ranks in both groups. At the lower end of the ranking, persistence was ranked lowest by female teachers, while self-regulation was ranked lowest by male teachers.

Table 3. *Scale values and bootstrap standard errors of student characteristics by participant characteristics.*

Characteristics	Group	*n*	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
			MuT	Inq	SC	Art	Prd	Org	SO	OI	Prs	SR
(a) General	All	405	0.494	0.484	0.456	0.327	0.258	0.255	0.112	0.063	0.008	0.000
			(0.052)	(0.053)	(0.048)	(0.051)	(0.051)	(0.055)	(0.044)	(0.045)	(0.037)	(0.031)
			SC	Inq	MuT	Art	Prd	Org	SO	OI	SR	Prs
(b) Sex	Female	237	0.463	0.450	0.393	0.321	0.200	0.172	0.049	0.047	0.042	0.000
			(0.061)	(0.069)	(0.066)	(0.063)	(0.065)	(0.069)	(0.052)	(0.052)	(0.058)	(0.035)
			MuT	Inq	SC	Org	Prd	Art	SO	OI	Prs	SR
	Male	168	0.705	0.597	0.511	0.434	0.402	0.398	0.263	0.146	0.081	0.000
			(0.086)	(0.084)	(0.077)	(0.093)	(0.087)	(0.084)	(0.070)	(0.077)	(0.081)	(0.030)
			SC	Inq	MuT	Art	Org	Prd	SR	SO	Prs	OI
(c) Seniority	Up to 5 years	185	0.492	0.436	0.429	0.348	0.232	0.216	0.191	0.097	0.027	0.000
			(0.074)	(0.074)	(0.074)	(0.076)	(0.076)	(0.074)	(0.081)	(0.062)	(0.049)	(0.031)
			MuT	Inq	SC	Org	Prd	Art	OI	SO	SR	Prs
	6-10 years	107	0.677	0.642	0.472	0.385	0.343	0.289	0.202	0.184	0.072	0.000
			(0.109)	(0.117)	(0.084)	(0.106)	(0.112)	(0.090)	(0.094)	(0.088)	(0.085)	(0.038)
			Inq	SC	MuT	Art	Prd	Org	Prs	OI	SO	SR
	11-15 years	60	0.762	0.735	0.725	0.706	0.621	0.539	0.317	0.302	0.286	0.000
			(0.147)	(0.162)	(0.140)	(0.156)	(0.140)	(0.169)	(0.158)	(0.145)	(0.132)	(0.018)
			MuT	Inq	SC	Art	Prd	SO	Org	OI	Prs	SR
	16 years or more	53	1.013	0.928	0.889	0.799	0.730	0.708	0.644	0.621	0.491	0.000
			(0.178)	(0.185)	(0.154)	(0.156)	(0.163)	(0.159)	(0.179)	(0.141)	(0.154)	(0.000)
			Inq	MuT	SC	Org	Art	Prd	OI	SR	SO	Prs
(d) School type	Preschool	49	0.911	0.873	0.865	0.687	0.673	0.663	0.597	0.386	0.202	0.000
			(0.171)	(0.172)	(0.153)	(0.193)	(0.170)	(0.172)	(0.120)	(0.186)	(0.138)	(0.031)
			MuT	Inq	SC	Prd	Art	Org	SO	OI	Prs	SR
	Primary school	74	0.794	0.756	0.686	0.601	0.518	0.457	0.423	0.364	0.331	0.000
			(0.132)	(0.146)	(0.127)	(0.142)	(0.138)	(0.137)	(0.125)	(0.130)	(0.123)	(0.005)
			MuT	Inq	SC	Art	Org	Prd	SO	Prs	OI	SR
	Middle school	149	0.540	0.534	0.416	0.352	0.274	0.213	0.110	0.057	0.035	0.000
			(0.085)	(0.089)	(0.081)	(0.081)	(0.088)	(0.083)	(0.065)	(0.075)	(0.066)	(0.048)
			SC	MuT	Inq	Art	Prd	Org	SO	SR	Prs	OI
	High school	133	0.506	0.415	0.400	0.339	0.241	0.235	0.174	0.119	0.032	0.000
			(0.086)	(0.092)	(0.088)	(0.086)	(0.083)	(0.085)	(0.078)	(0.086)	(0.058)	(0.037)

Note. Art: Articulate; Inq: Inquisitive; MuT: Multidimensional thinker; OI: Open to innovation; Org: Original; Prd: Productive; Prs: Persistent; SC: Self-confident; SO: Solution-oriented; SR: Self-regulated.

Differences were also observed across professional seniority groups. Among teachers with up to 5 years of experience, self-confidence was ranked first, followed by inquisitiveness and multidimensional thinking. For teachers with 6-10 years of experience and those with 16 years or more, multidimensional thinking ranked first, whereas inquisitiveness was the highest-ranked characteristic among teachers with 11-15 years of experience. Inquisitiveness ranked second in all seniority groups except the 11-15 years group, where self-confidence occupied the second position. Regarding the lowest-ranked characteristics, openness to innovation was ranked lowest among teachers with up to 5 years of experience, persistence was ranked lowest among teachers with 6-10 years of experience, and self-regulation was ranked lowest among teachers with 11 years or more of experience.

According to the school type rankings, there was also variation in the relative ordering of student characteristics. Inquisitiveness was ranked first by preschool teachers, multidimensional thinking by primary and middle school teachers, and self-confidence by high school teachers. The second-ranked characteristic was multidimensional thinking for preschool and high school teachers, and inquisitiveness for primary and middle school teachers. Self-confidence ranked third across preschool, primary, and middle school groups, whereas inquisitiveness ranked third among high school teachers. At the lower end of the ranking, persistence was ranked lowest by preschool teachers, self-regulation by primary and middle school teachers, and openness to innovation by high school teachers.

Group Differences in Rankings of Student Characteristics Associated with H-OT Skills

Table 4 presents group differences in raw ranking scores for student characteristics associated with H-OT skills according to sex, professional seniority, and school type. Since lower raw ranking scores indicate higher perceived importance, significant differences were interpreted accordingly.

By sex, significant differences were found for multidimensional thinking and self-regulation. Male teachers assigned higher importance to multidimensional thinking than female teachers, whereas female teachers assigned higher importance to self-regulation than male teachers. No broader sex-based pattern was observed across the remaining student characteristics.

Professional seniority was associated only with self-regulation. Teachers with up to 5 years of experience assigned higher importance to self-regulation than those with 11-15 years and 16 years or more of experience. Similarly, teachers with 6-10 years of experience assigned higher importance to self-regulation than those with 16 years or more of experience. This suggests that self-regulation was prioritized more strongly by teachers with relatively less professional experience.

School type was associated with significant differences in self-regulation, solution-orientedness, and persistence. High school teachers assigned higher importance to self-regulation than primary school teachers and higher importance to solution-orientedness than preschool teachers. For persistence, primary, middle, and high school teachers assigned higher importance than preschool teachers.

Table 4. *Group differences in raw ranking scores according to sex, seniority, and school type.*

Factors	*p* (Sex)	Significant difference	*p* (Seniority)	Significant difference	*p* (School type)	Significant difference
Prd	.408	—	.575	—	.446	—
Inq	.961	—	.438	—	.466	—
Art	.421	—	.228	—	.901	—
MuT	.013	Male < Female	.188	—	.629	—
SR	.019	Female < Male	< .001	Up to 5 years < 11-15 years (*p*_adj = .002); Up to 5 years < 16 years or more (*p*_adj = .001); 6-10 years < 16 years or more (*p*_adj = .011)	.020	High school < Primary school (*p*_adj = .011)
SO	.317	—	.293	—	.034	High school < Preschool (*p*_adj = .043)
Prs	.450	—	.640	—	.013	Primary school < Preschool (*p*_adj = .018); Middle school < Preschool (*p*_adj = .018); High school < Preschool (*p*_adj = .019)
SC	.165	—	.605	—	.620	—
OI	.675	—	.239	—	.062	—
Org	.118	—	.857	—	.822	—

Note. p values are based on raw ranking scores, not on derived scale values. Gender differences were tested using Mann-Whitney U. Seniority and institution differences were tested using Kruskal-Wallis H; when significant, pairwise Mann-Whitney U tests with Holm adjustment were applied. The less-than sign (<) indicates a lower raw ranking score, meaning that the group on the left assigned higher importance to the characteristic

Teachers' Rankings of Factors Fostering H-OT Skills

The ranking of factors influencing the development of H-OT skills is presented in Table 5(a), where scale values are reported together with bootstrap standard errors. Overall, teachers perceived parental attitudes as the most influential factor (1.217, *SE* = 0.070), followed by student personality (0.957, *SE* = 0.067), social environment (0.851, *SE* = 0.059), parental relationship (0.769, *SE* = 0.058), mother's education (0.704, *SE* = 0.064), age (0.641, *SE* = 0.061), teacher (0.565, *SE* = 0.057), father's education (0.441, *SE* = 0.058), household income (0.232, *SE* = 0.052), and gender (0.000, *SE* = 0.000), respectively. This pattern suggests that teachers attributed greater importance to family-related and individual student factors than to demographic factors. The rankings of factors influencing H-OT skill development across teacher characteristics are presented in Table 5(b-d). By sex, female and male teachers showed the same ranking pattern. In both groups, parental attitudes ranked first, followed by student personality and social environment. Gender was consistently ranked as the least influential factor.

Across professional seniority groups, parental attitudes ranked first in all groups. Student personality ranked second among teachers with up to 15 years of experience, whereas social environment (1.403, *SE* = 0.207) ranked second among teachers with 16 years or more of experience. In the 11-15 years group, parental attitudes (1.211, *SE* = 0.184) and student personality (1.199, *SE* = 0.154) had very close scale values, indicating that these two factors were perceived as similarly influential. Gender was ranked lowest across all seniority groups.

School-type rankings showed a similar pattern. Parental attitudes were ranked as the most influential factor across all school types. Social environment ranked second among preschool (1.213, *SE* = 0.184) and primary school teachers (0.991, *SE* = 0.132), whereas student personality ranked second among middle (1.136, *SE* = 0.116) and high school teachers (0.791, *SE* = 0.101). For high school teachers, mother's education (0.622, *SE* = 0.094) and social environment (0.621, *SE* = 0.087) had almost identical scale values, indicating that their relative order should be interpreted descriptively. Gender was consistently ranked as the least influential factor across all school types.

Group Differences in Rankings of Factors Fostering H-OT Skills

Table 6 presents group differences in raw ranking scores for factors influencing the development of H-OT skills according to sex, professional seniority, and school type. Since lower raw ranking scores indicate higher perceived importance, significant differences were interpreted accordingly. No significant differences were found by sex, indicating that female and male teachers ranked the factors influencing H-OT skill development in a broadly similar way.

Professional seniority was associated with significant differences in parental attitudes and gender. For parental attitudes, teachers with 6-10 years of experience assigned higher importance than those with up to 5 years of experience and those with 16 years or more. For gender, teachers with up to 5 years of experience assigned higher importance than those with 6-10 years and 16 years or more of experience. Teachers with 11-15 years of experience also assigned higher importance to gender than those with 16 years or more.

School type was associated with significant differences in gender and mother's education. High school teachers assigned higher importance to gender than middle school teachers. For mother's education, middle and high school teachers assigned higher importance than preschool teachers. Overall, the raw ranking comparisons indicate that statistically significant group differences were limited to a small number of factors. While sex did not differentiate the rankings, professional seniority was related mainly to parental attitudes and gender, and school type was related mainly to gender and mother's education.

Table 5. *Scale values and bootstrap standard errors by participant characteristics.*

Characteristics	Group	*n*	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
(a) General	All	405	PA 1.217 (0.070)	SP 0.957 (0.067)	SE 0.851 (0.059)	PR 0.769 (0.058)	ME 0.704 (0.064)	Age 0.641 (0.061)	Tch 0.565 (0.057)	FE 0.441 (0.058)	HI 0.232 (0.052)	Gnd 0.000 (0.000)
(b) Sex	Female	237	PA 1.190 (0.090)	SP 0.948 (0.089)	SE 0.868 (0.080)	PR 0.799 (0.077)	ME 0.721 (0.084)	Age 0.647 (0.085)	Tch 0.573 (0.075)	FE 0.452 (0.077)	HI 0.258 (0.066)	Gnd 0.000 (0.000)
	Male	168	PA 1.259 (0.106)	SP 0.972 (0.094)	SE 0.829 (0.080)	PR 0.731 (0.088)	ME 0.682 (0.095)	Age 0.635 (0.080)	Tch 0.554 (0.081)	FE 0.428 (0.086)	HI 0.196 (0.082)	Gnd 0.000 (0.003)
(c) Seniority	Up to 5 years	185	PA 0.941 (0.091)	SP 0.651 (0.091)	SE 0.631 (0.081)	PR 0.523 (0.078)	Age 0.418 (0.087)	ME 0.408 (0.086)	Tch 0.394 (0.081)	FE 0.207 (0.078)	HI 0.064 (0.063)	Gnd 0.000 (0.022)
	6-10 years	107	PA 1.638 (0.155)	SP 1.283 (0.132)	SE 1.132 (0.121)	PR 1.121 (0.121)	ME 1.013 (0.112)	Age 0.791 (0.119)	Tch 0.664 (0.110)	FE 0.644 (0.109)	HI 0.454 (0.110)	Gnd 0.000 (0.000)
	11-15 years	60	PA 1.211 (0.184)	SP 1.199 (0.154)	ME 0.783 (0.177)	SE 0.769 (0.134)	Age 0.736 (0.148)	Tch 0.733 (0.129)	PR 0.721 (0.144)	FE 0.532 (0.148)	HI 0.179 (0.140)	Gnd 0.000 (0.032)
	16 years or more	53	PA 1.622 (0.224)	SE 1.403 (0.207)	SP 1.355 (0.232)	ME 1.262 (0.217)	Age 1.229 (0.215)	PR 1.214 (0.197)	Tch 0.990 (0.185)	FE 0.947 (0.190)	HI 0.622 (0.140)	Gnd 0.000 (0.000)
(d) School type	Preschool	49	PA 1.357 (0.230)	SE 1.213 (0.184)	SP 1.038 (0.184)	PR 0.997 (0.207)	Tch 0.825 (0.135)	Age 0.793 (0.177)	HI 0.623 (0.179)	ME 0.553 (0.188)	FE 0.334 (0.177)	Gnd 0.000 (0.012)
	Primary school	74	PA 1.221 (0.159)	SE 0.991 (0.132)	SP 0.902 (0.164)	PR 0.810 (0.140)	Age 0.806 (0.162)	ME 0.691 (0.162)	FE 0.520 (0.147)	Tch 0.507 (0.135)	HI 0.159 (0.107)	Gnd 0.000 (0.017)
	Middle school	149	PA 1.362 (0.126)	SP 1.136 (0.116)	SE 0.903 (0.110)	PR 0.866 (0.100)	ME 0.855 (0.108)	Age 0.747 (0.099)	Tch 0.720 (0.092)	FE 0.597 (0.095)	HI 0.330 (0.088)	Gnd 0.000 (0.000)
	High school	133	PA 1.041 (0.100)	SP 0.791 (0.101)	ME 0.622 (0.094)	SE 0.621 (0.087)	PR 0.590 (0.084)	Age 0.403 (0.095)	Tch 0.355 (0.093)	FE 0.284 (0.085)	HI 0.037 (0.063)	Gnd 0.000 (0.038)

Note. PA: Parental attitudes; SP: Student personality; SE: Social environment; PR: Parental relationship; ME: Mother's education; Age: Age; Tch: Teacher; FE: Father's education; HI: Household income; Gnd: Gender.

Table 6. *Group differences in raw ranking scores.*

Factors	*p* (Sex)	Significant difference	*p* (Seniority)	Significant difference	*p* (School type)	Significant difference
Age	.945	—	.341	—	.339	—
PA	.124	—	.010	6-10 years < Up to 5 years; 6-10 years < 16 years or more	.753	—
PR	.534	—	.159	—	.633	—
HI	.423	—	.770	—	.092	—
SE	.718	—	.279	—	.039	Omnibus significant; no significant pairwise difference after Holm correction
Gnd	.223	—	< .001	Up to 5 years < 6-10 years; Up to 5 years < 16 years or more; 11-15 years < 16 years or more	.009	High school < Middle school
SP	.729	—	.088	—	.409	—
Tch	.906	—	.067	—	.208	—
ME	.781	—	.194	—	.013	Middle school < Preschool; High school < Preschool
FE	.943	—	.701	—	.107	—

Note. p values are based on raw ranking scores, not on derived scale values. Sex differences were tested using Mann-Whitney U. Seniority and institution differences were tested using Kruskal-Wallis H; when significant, pairwise *Mann*-Whitney U tests with Holm adjustment were applied. The less-than sign (<) indicates a lower raw ranking score, meaning that the group on the left assigned higher importance to the characteristic.

DISCUSSION and CONCLUSION

The present study provides a comprehensive portrayal of how H-OT skills are conceptualized, prioritized, and interpreted from the teachers' perspective in twenty-first-century Türkiye. Specifically, it elucidates which H-OT skills teachers consider most important, the characteristics that distinguish students who possess these skills, and the factors perceived to influence the development of such skills within a holistic framework. Additionally, examining whether all rankings based on teacher opinions differ significantly by gender, seniority, and school type allows for a more in-depth and comparative interpretation of the findings.

Teachers' Perspectives on H-OT Skills

The findings of this study show that teachers conceptualize H-OT skills as a set of skills, particularly with creative thinking at its center. This set of skills indicates that teachers perceive H-OT not only as the process of correctly using or analyzing information, but also as the capacity to generate original ideas, try different approaches, and develop flexible solutions to complex situations. This result is consistent with current approaches that consider creative and critical thinking as fundamental learning objectives in today's schools (Vincent-Lancrin *et al*., 2019). In addition, within the framework of PISA 2022, creative thinking is considered as the competence to generate, evaluate, and develop original and diverse ideas (OECD, 2024).

The research results show that teachers' perceptions of H-OT skills are centered not only on creative thinking but also on critical thinking, metacognitive thinking, problem-solving, and analytical thinking. This can be explained by the fact that H-OT skills involve multi-component cognitive processes. The low standard errors of the scale values at the sample level support the consistency of the general trend. However, the fact that the scale values for metacognitive thinking, problem-solving, and analytical thinking are quite close underlines the need to avoid establishing a sharp hierarchy among them. Çakır (2013) supports this conclusion by stating that H-OT skills include complex cognitive activities such as reasoning, decision-making, problem-solving, critical, and creative thinking. Similarly, Zengin (2018) considers these skills among the fundamental components of higher-order thinking. The finding by Demir-Başaran and Kuşuçuran (2019) that teachers associate H-OT more with creative thinking, critical thinking, analytical thinking, and problem-solving also aligns with the findings of the present study. Furthermore, these skills are prominently emphasized in contemporary curricula (Olukçu & Yıldız, 2022; Ünveren-Kapanadze, 2019), suggesting that teachers may be more familiar with them due to curriculum alignment and teaching practices.

However, teachers' perspectives on H-OT are not entirely uniform. Analyses based on raw rank differences show that gender and professional seniority differentiate the importance given to some skills. Sex-based differences may be interpreted in relation to gendered socialization and role-based expectations rather than as fixed differences between female and male teachers. Social role theory suggests that gendered roles and expectations may shape individuals' orientations and priorities in social and professional contexts (Eagly & Wood, 2016). From this perspective, male teachers' greater emphasis on creative thinking, problem-solving, and analytical thinking may reflect a stronger orientation toward agentic, solution-focused, and analytic dimensions of H-OT, whereas female teachers' greater emphasis on metacognitive thinking and knowledge transfer may reflect a stronger pedagogical concern with monitoring learning, regulating thinking, and applying knowledge across contexts.

Differences related to professional seniority can be interpreted by relating them to changes in teachers' professional priorities throughout their career stages. Less experienced teachers are generally encouraged to evaluate teaching decisions and classroom experiences during the professional learning process (Schön, 1983). The greater emphasis on reflective thinking by teachers with up to five years of experience may stem from the strong role of reflection in teacher education and early professional development. Teachers with 6-10 years of experience,

on the other hand, may have gravitated towards the creative and metacognitive dimensions of H-OT based on their classroom experiences gained in the early years of their careers. This interpretation is consistent with research suggesting that teachers' professional learning, commitment, and teaching orientations change throughout their career stages rather than developing linearly (Day & Gu, 2007).

Differences related to school type are more limited. In particular, the greater emphasis placed on reasoning by preschool teachers may be related to the central role of inquiry, exploration, language development, and everyday problem situations in early childhood education (Whittaker & McMullen, 2014). However, the generally limited differences according to school type indicate that teachers working at different educational levels share a common professional understanding of the core components of H-OT.

Teachers' Perspectives on Student Characteristics Associated with H-OT Skills

Research findings indicate that teachers define students with H-OT skills through a combination of cognitive, affective, and self-regulatory characteristics. In this context, multidimensional thinking, curiosity, and self-confidence stand out as the most central characteristics. However, the closeness of the scale values for these three characteristics suggests that they should not be interpreted as strictly separate priorities. Rather, it can be stated that teachers perceive students with H-OT skills as individuals who can approach a situation from different angles, ask questions, and trust their own thinking. This is consistent with the literature on higher-order thinking and critical thinking. Facione (2013) defines the ideal critical thinker not only by cognitive skills but also by tendencies such as curiosity, open-mindedness, flexibility, confidence in reasoning, and self-confidence in one's own reasoning abilities. Similarly, creative problem-solving research emphasizes that effective problem solvers differ in their ways of generating ideas, focusing on possibilities, and managing problem-solving processes (Selby *et al*., 2004). In this context, the emphasis teachers place on multidimensional thinking and curiosity can be interpreted as associating H-OT not as a singular cognitive process, but rather with flexible, inquisitive, and productive thinking. This interpretation is also consistent with contemporary educational frameworks that define creative thinking as the capacity to generate, evaluate, and develop original and diverse ideas in different contexts (OECD, 2024).

The prominence of self-confidence in the research is also significant. Teachers may have considered self-confidence not only as a personal trait but also as an element that enables students to engage in reasoning, express their thoughts, advocate for alternatives, and persevere in the face of complex tasks. From this perspective, self-confidence can serve as a bridge between students' cognitive potential and their classroom performance. Even if students possess analytical or creative thinking capacity, self-confidence, and self-efficacy can play a significant role in translating this capacity into classroom behaviors such as asking questions, providing explanations, and proposing solutions. This interpretation is consistent with findings showing that academic self-efficacy is related to participation in classroom discussions (Galyon *et al*., 2012) and with the literature on creative self-efficacy (Beghetto, 2006). This may explain why self-expression, productivity, originality, and solution-orientedness are also among the broader characteristics associated with H-OT.

However, the results indicate that teachers' views are not entirely uniform. While gender-based differences were limited, male teachers placed relatively more emphasis on multidimensional thinking, while female teachers placed more emphasis on self-regulation. Differences in seniority were also predominantly associated with self-regulation; this trait was more strongly emphasized by teachers with relatively less professional experience. This finding may be related to the increasing role of student-led learning planning, monitoring, and evaluation processes in teacher training and contemporary classroom practices. Research on self-regulated learning shows that teachers can support these skills both through direct strategy instruction

and by creating learning environments that require students to regulate their own learning (Dignath & Veenman, 2021).

School type showed a more pronounced difference in terms of self-regulation, problem-solving, and perseverance. The greater emphasis placed on self-regulation and problem-solving by high school teachers may be related to the expectation that students in higher education will be more independent, planned, and able to monitor their own learning. Indeed, self-regulated learning is closely related to the student's capacity to plan, monitor, evaluate, and reorganize their strategies when necessary (Dignath & Veenman, 2021; Vosniadou, 2020). Similarly, the greater emphasis placed on perseverance by elementary, middle, and high school teachers compared to preschool teachers can be explained by the fact that academic tasks in these school contexts have become more structured, goal-oriented, and require continuity. This interpretation is also supported by studies showing that perseverance is related to the tendency to sustain effort toward long-term goals and to continue working in the face of challenges (Duckworth *et al*., 2007). However, the overall pattern points to a common professional understanding among teacher groups: students with H-OT skills are seen as individuals who can think from multiple perspectives when faced with complex situations, ask questions, trust their own reasoning, and regulate their learning. This perspective is also consistent with learning science approaches that consider learning not only in terms of cognitive processes but also in conjunction with motivation, social interaction, culture, and learning environments (National Academies of Sciences, Engineering, and Medicine, 2018).

Teachers' Perspectives on Factors Fostering H-OT Skills

The findings of this study show that teachers do not limit the development of H-OT skills solely to classroom teaching processes but evaluate them within a multidimensional framework that includes the family, student, and social environments. The emergence of parental attitudes as the most influential factor indicates that teachers see the family environment as a decisive starting point in the development of H-OT skills. This interpretation is consistent with Vygotsky's (1978) approach, which explains the child's cognitive development through social interaction and adult guidance, and with the bioecological perspective that emphasizes that development is shaped by the reciprocal interactions between the individual and their environment within interconnected systems such as family, school, and social environment (Bronfenbrenner & Morris, 2006).

The prominence of parental attitudes is also supported by findings in the literature. Meta-analyses examining the impact of family involvement on student achievement show that parental expectations, support, and participation in the learning process are related to students' academic development (Castro *et al*., 2015). Similarly, parenting style and parenting dimensions are reported to be positively correlated with academic success (Pinquart, 2016). In this context, the fact that teachers rank parental attitudes at the highest level suggests that H-OT skills are not only cognitive skills acquired at school; they are also nurtured by communication, support, autonomy, and problem-solving opportunities offered at home. Grolnick and Ryan's (1989) finding that parental autonomy support and involvement are related to children's self-regulation and school competencies strengthens this interpretation.

The high ranking of student personality and social environment indicates that teachers consider H-OT development within the interaction of individual characteristics and environmental opportunities. The emphasis on student personality points to a teacher perception that traits such as curiosity, determination, openness, responsibility, and attitude towards learning can support higher-order thinking processes. The importance given to the social environment suggests that a student's way of thinking is shaped not only by individual capacity but also by interactions in their environment, linguistic experiences, and learning opportunities. Hoff's (2003) finding a relationship between socioeconomic level and parental communication with children's

language development helps explain why family-based variables, especially maternal education, are considered important by teachers.

The lack of a significant difference based on gender indicates that female and male teachers interpret the development of H-OT skills similarly. Furthermore, the fact that gender is generally considered one of the least influential factors is consistent with approaches that suggest social, cultural, and educational opportunities, rather than biological sex, are more decisive in the development of thinking skills. Else-Quest *et al*.'s (2010) finding that gender differences in mathematics achievement in different countries are more closely linked to sociocultural conditions and opportunities than biological factors supports this interpretation.

The fact that differences related to professional seniority and school type emerge in a limited number of factors suggests that teachers generally share a common perspective, but they weight some factors differently based on their professional experiences and the school context in which they work. In particular, differences regarding maternal education and parental attitudes point to the importance of home-based learning support and family-based opportunities in the development of H-OT skills. The literature has shown that maternal education, parental involvement, supportive parenting attitudes, and the home learning environment are related to children's cognitive and academic development (Carneiro *et al*., 2013; Castro *et al*., 2015; Melhuish *et al*., 2008; Pinquart, 2016). In conclusion, from a teacher's perspective, the development of H-OT skills can be considered a holistic process in which family attitudes, student characteristics, social environment, parental education, and teacher support work together.

Overall, the findings suggest that, from teachers' perspectives, the development of H-OT skills is shaped by the interaction of family, school, and social environment. The results show a common pattern across teacher groups, particularly in the importance given to creative thinking, multidimensional thinking, inquisitiveness, self-confidence, parental attitudes, student personality, and social environment. At the same time, the group comparison analyses indicate that teachers' perceptions differ in some respects according to sex, professional seniority, and school type. Therefore, the findings should be considered as a context-based contribution to understanding teachers' perceptions of H-OT skills rather than as a fully generalizable profile of all teachers. Within this scope, the study points to the need for holistic approaches that consider classroom practices together with family, student, and social-context variables.

Practical Implications

The findings may inform classroom practices, teacher education, and educational policy in several ways. In classroom settings, teachers may support H-OT skills by using open-ended tasks, discussion, inquiry, problem-based activities, and learning situations that require students to justify their ideas and consider different perspectives. Since creative thinking was ranked highly across teacher groups, classroom activities should provide students with opportunities to generate original ideas and alternative solutions. In teacher education and professional development programs, H-OT skills should be addressed not only as theoretical concepts but also through practical examples related to creative thinking, critical thinking, metacognitive thinking, problem-solving, and analytical thinking. The differences observed according to professional seniority and school type also suggest that professional development activities may be more useful when they include examples suitable for different educational levels and teaching experiences. At the policy level, the emphasis placed on parental attitudes, student personality, and social environment indicates that efforts to develop H-OT skills should not be limited to classroom instruction. Policies that strengthen school-family cooperation and support enriched learning environments may contribute to the development of these skills. However, these implications should be interpreted cautiously because the study was based on a convenience sample.

Limitations and Future Research

Although the present study offers valuable insights into H-OT skills from a teacher's perspective in contemporary Türkiye, it is subject to certain limitations. In addition, although the sample size was relatively adequate, the use of convenience sampling limits the representativeness of the sample; therefore, the findings should be interpreted cautiously in terms of generalizability. First, the study relied exclusively on teacher perceptions and did not incorporate student or parent perspectives. This limits the extent to which the multi-stakeholder nature of H-OT skill development can be fully captured. Second, because the data were based on self-reports, the relationship between teachers' perceptions and actual classroom practices or observed student behaviors could not be directly examined.

In light of these limitations, future research is encouraged to employ multi-stakeholder designs that integrate the perspectives of teachers, students, and parents. Experimental or quasi-experimental studies focusing on parenting practices and instructional approaches may yield stronger causal inferences regarding how H-OT skills can be effectively supported. Longitudinal studies conducted across different school types and educational levels could further illuminate the developmental trajectories of these skills. Finally, in-depth qualitative and quantitative investigations of sociocultural context, parental education, and educational equity are likely to make substantial contributions to the literature on the development of H-OT skills.

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. **Ethics Committee Number**: Erciyes University, 22.02.2022-95.

Data Availability Statement

Research data is available and can be sent with e-mail upon request.

Informed Consent

Written informed consent was obtained from the participants who participated in this study.

Contribution of Authors

Ö.K.K.: Investigation, data collection, Methodology, Supervision, Formal analysis, Validation, Writing - review & editing. **E.T.:** Investigation, Data collection, Methodology, Supervision, Formal analysis, Validation, Writing - review & editing.

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