INTERNATIONAL JOURNAL OF MODERN EDUCATION STUDIES

| Volume 9 - No 1 - June 2025 - ISSN 2618-6209 |

Research Article

Investigation of High School Students' Attitudes Towards Mind and Intelligence Games and the Relationship of Attitude Level with Some Demographic Characteristics

Neslihan Erbaşı[1] Süleyman Alpaslan Sulak[2]

Article Type
Original Research

International Journal of Modern Education Studies
2025
Volume 9, No 1
Pages: 178-197
http://www.ijonmes.net

Article Info:

Received 16.10.2024
Revision 03.02.2025
Accepted 10.05.2025

Abstract:

The aim of this study is to examine the attitudes of high school students towards mind and intelligence games and how these attitudes differ based on various variables. The study population consists of 800 students studying in different departments at Konya Selçuklu Türk Telekom Vocational and Technical Anatolian High School during the 2023–2024 academic year. The sample includes 192 students selected through the convenience sampling method and who voluntarily participated. Both the descriptive and relational survey models were used in the research. Data were collected using a personal information form and the "Attitude Scale Towards Intelligence Games" developed by Karapınar and Aydoğan (2020), and analyzed with the SPSS program. According to the findings, students' overall attitude towards mind and intelligence games was at the level of agreement (x=3.47). In terms of sub-factors, students showed a disagreement-level attitude toward the negative attitude factor (x=2.34), an agreement-level attitude toward the positive attitude factor (x=3.50), and a neutral attitude toward the behavioral element factor (x=2.81). Additionally, no statistically significant differences were found in students' attitudes based on gender, grade level, parental education, family income, or prior training on mind and intelligence games.

Keywords: Mind and intelligence games, attitude, high school students, intelligence.

Citation:
Erbaşı, N. & Sulak S.A. (2025). Investigation of High School Students' Attitudes Towards Mind and Intelligence Games and the Relationship of Attitude Level with Some Demographic Characteristics. *International Journal of Modern Education Studies, 9*(1), 178-197. https://doi.org/10.51383/ijonmes.2025.382

[1]Teacher, Ministry of Education, Konya, Türkiye, neslihan_gozel@hotmail.com,
https://orcid.org/0000-0003-2725-7001
[2]Assist.Prof.Dr., Necmettin Erbakan University, Konya, Türkiye, sulak@erbakan.edu.tr,
https://orcid.org/0000-0001-9716-9336

INTRODUCTION

Today's cultures and societies are undergoing a rapid evolution, driven by significant advances in science, knowledge, and technology, as well as the development of the internet and enhanced accessibility (Kalecı˙, 2018; Sulak & Koklu, 2024). One of the most important features of this new era in which information is at the forefront is the integration of digital technologies and teaching supportive methods in education systems and methodologies. In this framework, traditional teaching techniques have been replaced by the integration of various tools into the lessons. Especially in recent years, the integration of various supportive teaching methods and the use of digital and technological tools in education have gained prominence, driven by technological advancements that have facilitated the development of devices compatible with evolving technology (Koklu & Sulak, 2021). In this context, one of the teaching supportive methods integrated into education systems is mind and intelligence games.

According to the Turkish Language Association Dictionary (2023), intelligence is defined as a term that includes the abilities of thinking, reasoning, learning, visualization, grasping objects, perceiving objective facts, judgment, inference, physical control, perception of emotion, evaluation and invention (Turkish Language Association TDK Dictionary, 2023). In other words, intelligence refers to the cognitive capacity to attribute mental states to oneself and others (Goldman, 2012, p. 1). Intelligence is the environment in which the sequence of internal events or activities including thoughts, perceptions, sensations, etc. in an individual's mind takes shape. (Ikhianosime & Akalue, 2021, p. 83).

Games are facilitators that structure player behavior and whose main purpose is enjoyment (Allen et al., 2024, p. 2). Games are learning machines designed to experience a story or test cognitive skills, where players learn how to interact through systems within the game (Altura & Curwood, 2015, p. 25). Games play a critical role in cognitive development and are a vital factor, especially for children (Türkoğlu & Uslu, 2016, p. 52). The uncritical use of games in education actually contains an argument that has the potential to reduce inequality in learning processes (Whitton, 2013). Games are one of the methods frequently used by teachers to keep students active and open to learning in learning processes.

Although games have various effects on children, especially mind and intelligence games have important effects on their development (Güneş & Yünkül, 2021, p. 807). Mind and intelligence games are educational activities designed to help individuals discover their own talents, produce creative solutions to problems and continuously improve themselves, and develop high-level thinking skills. (Bizer et al., 2006, p. 247). Brain teasers can be defined as an area where intelligence is directly practiced; this game activity offers an aesthetic experience where intelligence and play are intertwined. (Caliskan & Sahin, 2022, p. 2). Brain teasers are activities that involve real problems and present different gamified problems.

For this reason, they can be considered as the most appropriate tools that can contribute to the development of children's cognitive skills such as improving their thinking skills, gaining various perspectives, improving reasoning, increasing their problem-solving skills, creating different strategies, analyzing, focusing, and establishing relationships. (Marangoz & Demirtaş, 2017, p. 614). Beyond recreational purposes, games and interactive environments can offer valuable and important insights from individual learners to parents, teachers and entire education systems (Ketamo, 2013). Games offer a micro-world where you can observe social organization at work. Structure, status, identity, power, time, memory, norms and values are all found in the game world (Perinbanayagam, 2006). In chess, for example, players have to use logic to predict their opponents' next move and at the same time formulate their own strategy. This game is a typical turn-taking game where black and white take turns making moves. Chess is a type of game that requires both players to know the history and rules of the game and is completely focused on knowledge and strategy rather than visual cues. Chess represents a mental challenge with perfect and complete information for both players (Meijering et al., 2018).

Intelligence games aim to increase students' cognitive abilities by increasing their ability to perceive and evaluate problems, create various perspectives, make quick and accurate decisions, improve their focusing skills, and effectively develop their reasoning and logical thinking capacities. (Dokumacı Sütçü, 2021, p. 990). Contrary to common perception, brain teasers do not only aim to increase mathematical abilities, but also to improve students' visual, auditory and social skills, and to strengthen skills such as strategic thinking, understanding abstract concepts, three-dimensional thinking, critical and creative thinking. (Çalışkan, 2019, p. 16). Thanks to intelligence games, students will reveal their talents and potentials in individual and teamwork, strengthen and increase their self-confidence, acquire regular study habits, and develop different solutions and strategies by adopting a brave attitude in case of failure. (Yağlı, 2019, p. 3). Individuals have to keep up with these changes in a world in constant change. Individuals need to have the mental skills to produce and apply creative solutions to the problems they face in this change. The ability to produce creative solutions that enable individuals to overcome difficulties can only be the product of a unique intelligence. In this context, activities that develop mental skills that enable individuals to produce practical solutions gain importance.

According to Dempsey et al. (2002), through various course contents and tools to be used in education, individuals will develop at the point of reaching the targeted abilities. Games in general and brain teasers in particular are effective tools for achieving these goals (Saygı et al., 2016, p. 281). It confirms the idea that the careful use of carefully planned teacher- guided and specific mental games can contribute to the maintenance and development of students' reasoning and problem-solving abilities. These skills are likely to have a positive impact on students' overall academic achievement in the long run (Bottino et al., 2013b, p. 62). Information processing skills, as a problem-solving strategy that develops in interaction with complex problem situations, can be assessed through the

challenging situations presented by mind and intelligence games (Adalıyılmaz, 2022, p. 2). It is possible to accept the potential of using mind and intelligence games as an effective tool in the context of developing individuals' attention and concentration capacities, gaining skills such as creative thinking, problem solving skills, high-level cognitive awareness, and social skills development. (Ayar, 2022, p. 6).

Attitude is a global and relatively permanent evaluation of a person, object or issue (good or bad) based on emotional, cognitive or behavioral information, varying in severity (Bizer et al., 2006, p. 247). The role of attitude in individuals' learning processes is extremely important. In this context, the variables affecting attitudes towards mental and cognitive games should be examined in detail. With mind and intelligence games, individuals develop analytical and creative thinking skills in the face of problems including real life problems. In the face of changing and developing science and technology, it is of great importance to determine student attitudes towards mind and intelligence games that develop such mental skills of individuals.

In the literature, there are no studies that examine high school students' attitudes towards mind and intelligence games and the relationship between attitudes and some demographic variables. For this reason, this section includes the findings of various studies focusing on the effects of mind and intelligence games on students.

Marangoz & Demirtas (2017) found that mind and intelligence games increased the cognitive ability levels of 2nd grade students. Based on this finding, they emphasized the importance of mind and intelligence games for primary school students.

Researchers have generally found that the use of mind and intelligence games in lessons contributes to students' achievement of various gains. In general, these studies show that mind and intelligence games increase students' problem solving, decision-making skills, patient behavior and school satisfaction (Esen, 2019), analytical thinking, critical thinking, decision-making skills (Baş et al., 2020), verbal skills, observation skills (Ekiçi et al., 2017), aggressive behaviors (Gençay et al., 2019), development of higher order thinking and reasoning skills (Güneş & Yünkül, 2021), development of creative thinking skills, giving students a different perspective, making the lesson fun (Yılmaz & İkikardeş, 2020), support the student's active participation in the lesson (Kama Yilmaz, 2019), attitude towards mathematics course (Angin, 2022), higher order thinking skills, student achievement, mathematical skills (Kel & Kul, 2021), progression of creative thinking, higher-order cognitive awareness, focusing and social skills (Setting, 2022), access to information processing thinking skills (Adaliyilmaz, 2022), mental skill levels (Marangoz & Demirtas, 2017), reflective thinking skills (Şanlidağ & Aykaç, 2021).

Mind and intelligence games are one of the important areas that have been tried to be integrated into the Turkish education system. The mind and intelligence games course has been added to the elective course pool for the Turkish education system, but it has not reached the compulsory course format. There are academic studies that reveal that this

elective course is effective on students' academic achievement (Bottino et al., 2013a; Çağan & Usta, 2023; Gabrito et al., 2023; Kumar et al., 2023; Kel & Kul, 2021). In addition to this basic finding, although the number of studies emphasizing the effects of mind and intelligence games on students' academic achievement is quite high, there are also a small number of research findings that do not find a statistically significant relationship between the concepts (Cabrillos et al., 2023).

There are also academic research findings that the integration of mind and intelligence games into the education system has an impact on many factors other than students' academic achievement (Esen, 2019; Ekiçi et al., 2017; Gençay et al., 2019). When these broad effects of mind and intelligence games on students are evaluated together, it is thought that including mind and intelligence games in education systems will make important contributions to the Turkish education system.

In addition to this effect, determining students' attitudes towards mind and intelligence games and some variables affecting these attitudes will be an important factor for educational policies to be developed in this direction. Because it is a generally accepted fact that the most important factor that directs the emergence of behaviors is attitude. For this reason, the researches to be conducted to determine the level of students' attitudes towards mind and intelligence games and some variables affecting these attitudes have the importance of being an important input element for the educational policies to be developed in this regard.

Although there are various studies in the academic literature on students' attitudes towards mind and intelligence games, the number of studies examining the level of differentiation of these attitudes according to some demographic characteristics is quite low. In particular, the number of studies on this subject in the domestic literature is quite limited. In addition, according to Budak & Saban (2023), among the studies on mind and intelligence games in the literature, no research was found that identified high school students as the study group (Budak & Saban, 2023, p. 895). Analyzing high school students' attitudes towards mind and intelligence games and determining how these attitudes change according to various demographic factors can provide important guidance for the development of educational policies and practices. Based on this idea, this study aimed to examine high school students' attitudes towards mind and intelligence games and the differentiation of attitudes in terms of various variables. In line with this main purpose, this study sought answers to the following research questions.

1. What is the level of high school students' attitudes towards mind and intelligence games?
2. Do high school students' attitudes towards mind and intelligence games differ according to some demographic characteristics?
    a. Do high school students' attitudes towards mind and intelligence games differ significantly according to gender?

b. Do high school students' attitudes towards mind and intelligence games differ significantly according to the grade of education?
c. Do high school students' attitudes towards mind and intelligence games differ significantly according to their mother's education level?
d. Do high school students' attitudes towards mind and intelligence games differ significantly according to their fathers' level of education?
e. Do high school students' attitudes towards mind and intelligence games differ significantly according to the income status of the family?
f. Do high school students' attitudes towards mind and intelligence games differ significantly according to their previous participation in a training on mind and intelligence games?

METHOD

Design of the Study

Scientific research approaches are generally classified into three different approaches: qualitative research, quantitative research and mixed research (Williams, 2007, p. 65). This study is based on a quantitative research approach.

Research Design

In this study, the descriptive survey model was used because it was aimed to determine the attitudes of high school students towards mind and intelligence games and the relational survey model was used together because the differentiation of attitudes according to some demographic variables was examined.

Population and Sample of the Study

The population of the study consists of 800 students studying in different departments of Konya Selçuklu Türk Telekom Vocational and Technical Anatolian High School in the 2023-2024 academic year. The sample of the study consists of 192 students who were determined according to the convenience sampling method and who participated in accordance with the principle of voluntariness. The findings regarding the demographic characteristics of the students participating in the study are presented in Table 1.

Table 1

Descriptive Statistics of Demographic Variables (n=192)

Category	Variable	n	%
Gender	Girl	40	20,8
	Male	152	79,2
Classroom	9	4	2,1
	10	73	38,0
	11	72	37,5
	12	43	22,4
	Never Read	2	1,0
	Primary School	94	49,0
	Middle School	35	18,2

Mother Education Level	High School	46	24,0
	Associate degree	3	1,6
	License	10	5,2
	Postgraduate	2	1,0
	Never Read	2	1,0
	Primary School	43	22,4
	Middle School	46	24,0
Father's Education Level	High School	64	33,3
	Associate degree	11	5,7
	License	20	10,4
	Postgraduate	6	3,1
	17,001 TL and below	48	25,0
Family Income Level	17.002 TL - 45.000 TL	120	62,5
	Over 45.000 TL	24	12,5
Status of Previous Training on Intelligence Games	Yes	70	36,5
	No	122	63,5

As can be seen in Table 1, among the 192 students who participated in the survey, 20.8% (40 students) were female and 79.2% (152 students) were male. Of the participating students, 2.1% (4 students) were 9th grade students, 38% (73 students) were 10th grade students, 37.5% (72 students) were 11th grade students, and 22.4% (43 students) were 12th grade students. While 1% (2 students) of the students had never been to school, 49% (94 students) had primary school diplomas, 18.2% (35 students) had secondary school diplomas, 24% (46 students) had high school diplomas, 1.6% (3 students) had associate's degrees, 5.2% (10 students) had undergraduate degrees and 1% (2 students) had graduate degrees. While 1% (2 students) of the students' fathers had never been to school, 22.4% (43 students) had primary school diplomas, 24% (46 students) had secondary school diplomas, 33.3% (64 students) had high school diplomas, 5.7% (11 students) had associate's degrees, 10.4% (20 students) had undergraduate degrees and 3.1% (6 students) had graduate degrees. It was observed that 25% (48 students) had a family income of less than 17,001 TL per month, 62.5% (120 students) had a family income between 17,002 TL - 45,000 TL per month and 12.5% (24 students) had a family income of more than 45,000 TL per month. Of the participant students, 36.5% (70 students) stated that they had received a training on mind and intelligence games before and 63.5% (122 students) stated that they had not received any training before.

Data Collection Tools

The questionnaire consists of two main parts. In the first part of the questionnaire, the 22-item Attitude Toward Mind Games Scale developed by Kurupınar & Aydoğan (2020) was included. In the second part of the questionnaire form, there are 6 items containing the demographic characteristics of the participants created by the researcher (gender, grade, mother's education level, father's education level, family income level, whether they have attended a training on mind and intelligence games before).

Data Analysis

Permission was obtained from the authors for the use of the scale electronically. SPSS 21.0 program was used in the process of analyzing the research data. Since items 2-4-6-6-8-11-14-15-18-19-20 and 22 of the negative attitude factor in the questionnaire form were inverted items, the data obtained during coding into the SPSS program were reversed.

In order to see the attitudes of the participants towards mind and intelligence games, arithmetic mean, one of the measures of central tendency, and standard deviation, one of the measures of dispersion, were used to see the homogeneity of the data on the axis of their centers. Score range coefficients were used to evaluate the answers given to the items in the scale. The scale was organized as a Likert-type five-point scale and the relevant score ranges were determined between 1,00-1,79 "Strongly Disagree", between 1,80-2,59 "Disagree", between 2,60-3,39 "Undecided", between 3,40-4,19 "Agree" and between 4,20-5,00 "Strongly Agree". Since the coding of the reverse items in the scale was corrected, the evaluations were carried out accordingly.

Before starting the analyses for the difference tests, it was examined whether the data were normally distributed. These data will provide us with parametric or nonparametric options in deciding which analysis technique to use. At this stage, since the data set was larger than 50, the Kolmogorov Smirnov Goodness of Fit Test was performed, and the skewness and kurtosis values of the data were also examined. Regarding the normal distribution findings, if it is determined that the data are normally distributed, parametric tests are planned to be used in differentiation tests, and if it is determined that the data are not normally distributed, nonparametric tests are planned to be used.

Validity and Reliability of the Study

In order to measure students' attitudes towards mind and intelligence games, the "Attitude Towards Intelligence Games Scale" consisting of 22 items developed by Karapınar & Aydoğan (2020) with a validity and reliability study was used. As a result of the analysis, a three-factor structure emerged and this structure explained 53.35% of the total variance. The factors obtained as a result of construct validity were labeled as Negative Attitude (11 items), Positive Attitude (6 items) and Behavioral Item (5 items) sub-dimensions. Item-test correlations ranged between 0.50 and 0.82, while Cronbach's alpha reliability coefficients of the scale ranged between 0.81 and 0.89. The Cronbach's alpha coefficient of the whole scale was determined as 0.89. According to these data, it can be stated that the scale used in the study has a high degree of reliability.

Ethical Considerations

In this study, all information was obtained and presented within the framework of ethical behavior and academic rules. In addition, when the works of others were utilized, the sources were cited in accordance with scientific rules and added to the list of references by citation. In order to use the data collection tool used in this study, permission was obtained via e-mail from the researchers who prepared the scale. The scale was applied to

the teachers in the sample with the help of an online form. The teachers participated voluntarily in filling out the scale used for the research.

Ethical Review Board: Necmettin Erbakan University Social and Behavioral Sciences Institutional Review Board Ethics Committee

Date of Ethics Review Decision: 01/03/2024

Ethics Assessment Document Issue Number: 2024/207

Findings

The average and standard deviation values of the data obtained from the research are presented in Table 2. Accordingly, it was determined that the participant students had an attitude towards mind and intelligence games at the level of participation (x=3,47). When the attitudes of the students were examined in terms of sub-factors, it was seen that they had a disagree level attitude towards the negative attitude factor (x=2,34), an agree level attitude towards the positive attitude factor (x=3,70) and an undecided level attitude towards the behavioral element factor (x=2,81). When a comparison was made between the sub- factors, it was determined that the highest attitude was positive attitude, followed by behavioral element and negative attitude respectively. It is seen that the relatively positive attitude factor has a significantly higher average attitude than the other factors.

Table 2

Mean Values Regarding Participants' Attitudes Towards Mind and Intelligence Games

No	Articles	Average	Standard Deviation
	Negative Attitude Factor	2,3442	,64639
2	Brain games do not socialize people.	2,4740	1,18425
4	Brain teasers do not develop attention skills.	1,9792	1,00761
6	I don't want to work on brain teasers.	2,6406	1,04907
8	I get bored quickly when I play brain teasers.	2,7031	1,19790
11	I don't want to be friends with people who play brain teasers.	2,0937	1,09332
14	I feel uncomfortable when I see people playing brain teasers.	1,9531	1,00932
15	I don't watch videos teaching brain teasers.	2,8698	1,24855
18	There is no benefit to playing brain teasers.	1,9375	1,09556
19	I would not want to use brain teasers in lessons/activities.	2,3854	1,14745
20	I can't finish a mind game I've started.	2,2552	1,02965
22	I don't want to be a member of communities that play brain teasers.	2,4948	1,07809
	Positive Attitude Factor	3,6997	,84145
1	I would like to receive training on brain teasers.	3,1875	1,29285
3	I think that brain teasers should be supported by official institutions.	3,7083	1,10132
5	Brain games increase problem solving skills.	4,0521	,94752
7	I would like to be someone who plays brain teasers well.	3,7344	1,13362
9	I think every school should have an environment where brain teasers can be played.	4,0208	1,12542
13	I would like to see brain teaser competitions at the national level.	3,4948	1,17120
	Behavioral Item Factor	2,8156	,78625

10	I read publications on brain teasers.	2,5260	1,05322
12	I play brain teasers with electronic devices whenever I can.	3,1198	1,24540
16	In my free time, I play brain teasers with people around me.	3,0938	1,17191
17	I share posts about brain teasers on social media.	2,2083	1,01730
21	When I see a different brain teaser that interests me, I buy it.	3,1302	1,17955
	Mean for the Whole Scale	3,4768 *	,56517

* While calculating the average attitude level for the whole scale, the items in the Negative Attitude factor were reversed.

Before proceeding to the analyses for the difference tests, the normal conditions of the data were examined. At this stage, since the data set was larger than 50, the Kolmogorov Smirnov Goodness of Fit Test was performed, and the skewness and kurtosis values of the data were also examined. The normality test findings of the obtained data are shown in Table 3.

Table 3

Normality Test Results

Variable	Skewness and Kurtosis Values		Kolmogorov-Smirnov Test		
	Skewness	*kurtosis*	*Statistics*	*Standard Error*	*p*
Factor 1. Negative Attitude	-,636	1,344	,081	192	,004
Factor 2. Positive Attitude	-,693	,335	,104	192	,000
Factor 3. Behavioral Element	,131	,300	,083	192	,002
Attitudes towards Mind and Intelligence Games	-,101	,125	,050	192	,200*

Tabachnick & Fidell (2013) emphasize that if the kurtosis and skewness values are within the range of +1.5 and -1.5, the data exhibit a normal distribution. According to the normality findings obtained from Table 3, skewness and kurtosis values of the data showed normal distribution findings in all sub-dimensions and attitudes towards the whole scale. However, the findings of the Kolmogorov-Smirnov Test show that the data for the whole scale do not exhibit a normal distribution, while the findings for the factor sub-dimensions show normal distribution. For this reason, Pearson Correlation Analysis, which shows the assumptions of normal distribution, was performed when examining the correlation findings between factors. However, nonparametric tests were used to test the participants' attitudes towards mind and intelligence games according to some demographic variables.

Kaiser Meyer Olkin (KMO) and Bartlett values of the Attitude Towards Intelligence Games Scale used in the study were analyzed. As a result, KMO value was found to be 0.827 and Bartlett value was found to be significant ($\chi 2$ =1460,271, df=231, p=0.000). In addition, the variance explanation rate of the 3-factor structure was determined as 47.543%. In Table 4, Pearson Correlation Analysis findings are presented to examine the relationships between the factors.

Table 4

Relationships between Factors

Factor	Factor 1 Negative Attitude	Factor 2 Positive Attitude	Factor 3 Behavioral Element
Factor 1. Negative Attitude	1		
Factor 2. Positive Attitude	,428** (p=,000)	1	
Factor 3. Behavioral Elem.	,187** (p=.009)	,551** (p=,000)	1

** Correlation is significant at 0.01 level.

According to the findings obtained from Table 4, significant relationships were found between all factors at the 0.01 level. Table 5 shows the number of items and Cronbach's alpha values for the factors and the whole scale.

Table 5

Number of Items and Cronbach's Alpha Values of the Scale and Factors

Factor	Number of Articles	Cronbach's Alpha
Factor 1. Negative Attitude	11	,807
Factor 2. Positive Attitude	6	,837
Factor 3. Behavioral Element	5	,728
Attitude Scale Towards Mind and Intelligence Games	22	,860

According to the findings in Table 5, the reliability level was found to be high in all factors and the entire scale. While Cronbach's alpha reliability coefficient values were found between .728 and .837 in the factors, Cronbach's alpha reliability coefficient for the whole scale was found to be .860. Accordingly, it can be said that the scale is sufficiently reliable.

For the second sub-objective of the study, nonparametric tests were used to determine whether high school students' attitudes towards mind and intelligence games differed in terms of a) gender, b) grade level, c) mother's education level, d) father's education level, e) family income status, f) previous participation in a training on mind and intelligence games.

Mann-Whitney U Test was conducted to examine whether high school students' attitudes towards mind and intelligence games differed according to gender and the findings are shown in Table 6.

Table 6

Mann-Whitney U Test Results Regarding the Attitude Levels of High School Students Towards Mind and Intelligence Games According to Gender

Variables	Categories	N	Row Mean.	sd	x^2	p
Attitudes towards Mind and Intelligence Games	Girl	40	97,98	312,544	2.981,000	,850
	Male	152	96,11			

Mann Whitney U Test was used to reveal the differences between male and female students' attitudes towards mind and intelligence games. According to the results obtained in Table 6, it was determined that the attitude scores towards mind and intelligence games did not differ statistically significantly according to gender (U=2.981,000, p=0.85).

Kruskal Wallis H Test was conducted to examine whether high school students' attitudes towards mind and intelligence games differed according to their grades and the findings are shown in Table 7.

Table 7

Kruskal Wallis H Test Results Regarding the Attitude Levels of High School Students Towards Mind and Intelligence Games According to Their Grades

Variables	Categories	N	Row Mean.	x^2	p
Attitudes towards Mind and Intelligence Games	9	4	74,88	,744	,863
	10	73	98,68		
	11	72	96,26		
	12	43	95,21		

Kruskal Wallis H Test was used to reveal the differences in students' attitudes towards mind and intelligence games according to their grades. According to the results obtained in Table 7, it was determined that the attitude scores towards mind and intelligence games did not differ statistically significantly according to the classes (H=0,744, p=0,863).

Kruskal Wallis H Test was conducted to examine whether high school students' attitudes towards mind and intelligence games differed according to their mother's education level. The findings obtained are presented in Table 8.

Table 8

Kruskal Wallis H Test Results Regarding High School Students' Attitude Levels Towards Mind and Intelligence Games According to Mother's Education Status

Variables	Categories	N	Row Mean.	x^2	p
Attitudes towards Mind and Intelligence Games	Never Read	2	102,75	1,726	,943
	Primary School	94	97,89		
	Middle School	35	88,63		
	High School	46	100,66		
	Associate degree	3	87,33		
	Undergraduate	10	88,45		
	Postgraduate	2	121,00		

Kruskal Wallis H Test was used to reveal the differences in students' attitudes towards mind and intelligence games according to their mother's education status. According to the results obtained in Table 8, it was determined that the attitude scores towards mind and intelligence games did not differ statistically significantly according to the mother's education level (H=1,726, p=0,943).

Kruskal Wallis H Test was conducted to examine whether high school students' attitudes towards mind and intelligence games differed according to their father's education level. The findings obtained are presented in Table 9.

Table 9

Kruskal Wallis H Test Results Regarding the Attitude Levels of High School Students Towards Mind and Intelligence Games According to Father's Education Status

Variables	Categories	N	Row Mean.	x^2	p
Attitudes towards Mind and Intelligence Games	Never Read	2	64,25	6,549	,365
	Primary School	43	95,87		
	Middle School	46	97,68		
	High School	64	96,91		
	Associate degree	11	123,91		
	Undergraduate	20	94,00		
	Postgraduate	6	56,42		

Kruskal Wallis H Test was used to reveal the differences in students' attitudes towards mind and intelligence games according to their father's education level. According to the results obtained in Table 9, it was determined that the attitude scores towards mind and intelligence games did not differ statistically significantly according to the father's education level (H=6,549, p=0,365).

Kruskal Wallis H Test was conducted to examine whether high school students' attitudes towards mind and intelligence games differed according to the income status of the family. The findings obtained are presented in Table 10.

Table 10

Kruskal Wallis H Test Results Regarding High School Students' Attitudes Towards Mind and Intelligence Games According to Family Income Status

Variables	Categories	N	Row Mean.	x^2	p
Attitudes towards Mind and Intelligence Games	Under 17.001 TL	48	95,56	,631	,729
	17.002 TL - 45.000 TL	120	98,43		
	Over 45.000 TL	24	88,71		

The Kruskal Wallis H Test was used to reveal the differences in students' attitudes towards mind and intelligence games according to family income status. According to the results obtained in Table 10, it was determined that the attitude scores towards mind and intelligence games did not differ statistically significantly according to family income status (H=0,631, p=0,729).

Mann-Whitney U Test was conducted to examine whether the attitudes of high school students towards mind and intelligence games differed according to whether they had received a training on mind and int-elligence games before. The findings obtained are presented in Table 11.

Table 11

Mann-Whitney U Test Results Regarding the Attitude Levels of High School Students According to Whether They Have Received a Training on Mind and Intelligence Games Before or Not

Variables	Categories	N	Row Mean.	sd	x^2	p
Attitudes towards Mind and Intelligence Games	Trained	70	100,86	370,415	3.964,500	,410
	No Trained	122	94,00			

Mann Whitney U Test was used to reveal the differences in students' attitudes towards mind and intelligence games according to whether or not they had received any previous education. According to the results obtained in Table 11, it was determined that the attitude scores towards mind and intelligence games did not differ statistically significantly according to whether or not they had received a training on this subject before (U=3.964,500, p=0,41).

CONCLUSION, DISCUSSION AND RECOMMENDATION

Key Findings

Mind and intelligence games have shown significant effects on a variety of factors such as students' academic performance, class participation and motivation to learn. However, as these studies only focus on specific disciplines, there remains a gap in the literature regarding the framework for learning across academic programs. As a result, the efficient integration of mind and intelligence games into the educational process has become an important area for academic research. (Vlachopoulos & Makri, 2017, p. 15).

According to the findings obtained from the analysis of the data obtained with the participation of 192 high school students, it was determined that high school students had an attitude towards mind and intelligence games at the level of participation (x=3.47). Discussions in the academic literature are generally in the direction that mind and intelligence games are seen as fun by students (Ketamo, 2013; Meijering et al., 2018). In this context, while the main expectation was that the students' attitudes towards mind and intelligence games would be positive at a high level, it was found to be at a relatively lower level but still positive. It is thought that the reason for this situation is that the students have not interacted with mind and intelligence games at a sufficient level in their schools and therefore do not know mind and intelligence games sufficiently.

Another finding obtained in the research is in terms of the sub-dimensions of attitude towards mind and intelligence games. Accordingly, it was observed that students had a disagree level attitude towards the negative attitude factor (x=2,34), an agree level attitude towards the positive attitude factor (x=3,70) and an undecided level attitude towards the behavioral element factor (x=2,81). When a comparison was made between the sub-factors, it was determined that the highest attitude was in the positive attitude factor, followed by the behavioral element and the negative attitude factor, respectively. It is seen that the relatively positive attitude factor has a significantly higher average attitude than the other

factors. This result was generally as expected. This result shows that high school students have a relatively high level of attitude towards mind and intelligence games, albeit lower than expected, but this attitude is not reflected in behavior at the same level.

Unexpected Results

Therefore, it was evaluated that there is a need for various searches to increase the level of positive attitude in students, but there is also a need for strategies to transform this attitude into behavior. Because the positive attitude at the level of participation (x=3,70) turns into behavior at the level of ambivalence (x=2,81). However, the fact that the lowest factor is in the negative attitude factor (x=2,34) is considered as a positive situation.

In addition, the level of differentiation of high school students' attitudes towards mind and intelligence games was examined according to gender, grade level, mother's education level, father's education level, family income level and participation in a training on mind and intelligence games before. According to the findings obtained from Mann-Whitney U and Kruskal-Wallis H Tests, it was determined that high school students' attitudes towards mind and intelligence games did not differ statistically significantly according to any demographic variable.

Budak & Saban (2023) analyzed 44 studies, 21 of which were theses and 23 articles, in their research on the examination of scientific research on mind and intelligence games in 2014-2022. According to the findings obtained by the researchers, 10 of the studies published in the literature between these dates were conducted on teachers, 6 on prospective teachers, 1 on preschool students, 6 on primary school students, 11 on secondary school students and 1 on parents, and the remaining 9 were evaluated in other categories such as document review, book review, etc. (Budak & Saban, 2023, p. 895). The most important finding concerning our research is that there is no research on the high school sample group in the literature between the relevant dates. Therefore, there is no research in the literature on mind and intelligence games in the universe of high school students. As a result, this study is the first research on mind and intelligence games that takes high school students as the study group. In this respect, it is thought to make important contributions to the literature.

Policy Implications

One of the factors affecting the positive gains of the integration of mind and intelligence games into lessons is the student's attitude towards it. In fact, it would be quite realistic to develop assumptions that the gains obtained by students with positive attitudes towards mind and intelligence games are more than students with relatively low levels of positive attitudes. In this context, examining students' attitudes towards mind and intelligence games and thus determining the current situation can provide important contributions to teachers, school administrators, educational administrators, families and researchers working on this subject. In addition, determining some demographic characteristics that affect students' attitude levels is very meaningful in terms of guiding the educational policies to be developed in this regard. In this context, our study is very valuable

in terms of determining the attitudes of high school students towards mind and intelligence games and some demographic characteristics affecting their attitudes.

It was assumed that the participants responded to the data collection tools used in the study in a way that reflected their true thoughts and that there was no interaction between the participating students during the implementation of the questionnaires that would affect the results of the research. It was also assumed that the students who participated in the surveys had the competence to comprehend and understand the meaning of the scale items and to code them, and that there were no external factors (e.g. teacher pressure, etc.) that would affect the feelings and thoughts of the participating students. The findings obtained in the study are limited to the data obtained from 192 students studying in a public school in Selçuklu district of Konya province in the 2023-2024 academic year and the responses of the participant students to the data collection tools used.

REFERENCES

Adalıyılmaz, F. (2022). *Akıl ve Zeka oyunlar Öğretiminin Bilgi İşlemsel Düşünme Becerileri Erişisine Etkisi ve Bu Konuda Öğrenci Görüşleri [The Effect Of Teachıng Mind And Intelligence Games On Achıevement Of Computational Thinkıng Skills And Student Opinions On This Topic]* [Master's Thesis]. Necmettin Erbakan University Institute of Educational Sciences.

Allen, K. R., Brändle, F., Botvinick, M. M., Fan, J., Gershman, S. J., Gopnik, A., Griffiths, T. L., Hartshorne, J. K., Hauser, T. U., Ho, M. K, De Leeuw, J. R., Ma, W. J., Murayama, K., Nelson, J. D., Van Opheusden, B., Pouncy, H. T., Rafner, J., Rahwan, I., Rutledge, R., ... Schulz, E. (2023). *Using Games to Understand the Mind.* 1035–1043 (2024). https://doi.org/10.1038/s41562-024-01878-9

Altura, G. J., & Curwood, J. S. (2015). Hitting Restart: Learning and Gaming in an Australian Classroom. *Journal of Adolescent & Adult Literacy, 59*(1), 25-27. https://doi.org/10.1002/jaal.438

Angin, N. (2022). *Investigation of the Effect of Mind and Intelligence Games Applications on the Attitude, Motive and Learning Strategies of Middle School 7th Grade Students towards Mathematics Course* [Master's Thesis]. Aydın Adnan Menderes University Institute of Science and Technology.

Ayar, A. (2022). *Akıl ve Zeka Oyunlarının İlkokul 4. Sınıf Öğrencilerinin Yaratıcı Düşünme, Üst Bİlişsel Farkındalık, Dikkat ve Sosyal Skeri Düzeylerine Etkinin İncelenmesi [The Effects of Mind and Intelligence Games in Primary School: An In-depth Analysis]* [Master's Thesis]. Ege University Institute of Educational Sciences.

Baş, O., Kuzu, O., & Gök, B. (2020). The Effects of Mind Games on Higher Level Thinking Skills in Gifted Students. *Journal of Education and Future, 17*, 1-13. https://doi.org/10.30786/jef.506669

Bizer, G. Y., Barden, J. C., & Petty, R. E. (2006). Attitudes. In L. Nadel (Ed.), *Encyclopedia of*

Cognitive Science (1st bs). Wiley. https://doi.org/10.1002/0470018860.s00483

Bottino, R. M., Ott, M., & Tavella, M. (2013a). Children's Performance with Digital Mind Games and Evidence for Learning Behavior. In M. D. Lytras, D. Ruan, R. D. Tennyson, P. Ordonez De Pablos, F. J. García Peñalvo, & L. Rusu (Eds.), *Information Systems, E-learning, and Knowledge Management Research* (Vol. 278, pp. 235-243). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-35879-1_28

Bottino, R. M., Ott, M., & Tavella, M. (2013b). Investigating the Relationship Between School Performance and the Abilities to Play Mind Games. *In Proceedings of the European Conference on Games Based Learning*, 62-71.

Budak, D., & Saban, A. İ. (2023). Investigation of Scientific Research on Mind and Intelligence Games. *National Journal of Education*, *3*(5), 890-904. https://doi.org/10.5281/ZENODO.8070101

Cabrillos, L. E., Gapasin, J. D., Marfil, J. A., & Jr, V. L. C. (2023). Examining the Effects of Online Games on The Academic Performance of BPEd Students of Sultan Kudarat State University, Philippines. *Indonesian Journal of Educational Research and Technology*, *3*(1), 13-18. https://doi.org/10.17509/ijert.v3i1.43732

Çağan, B., & Usta, N. (2023). Investigation of the Effect of Mind and Intelligence Games on Mathematics Achievement of Secondary School Students. *The Journal of Academic Social Resources*, *8*(52), 3331-3341. https://doi.org/10.29228/ASRJOURNAL.71353

Çalışkan, M., & Şahin, A. (2022). Parent Attitude Scale Towards Mind and Intelligence Games. *Uşak University Journal of Social Sciences*, *XV*(2), 1-13.

Çalışkan, S. H. (2019). *Teacher and Student Opinions on the Secondary School Zekâ Games Course Curriculum* [Master's Thesis]. Hacettepe University Institute of Educational Sciences.

Dokumacı Sütçü, N. (2021). Thematic and Methodological Analysis of Scientific Research on Intelligence Games. *Electronic Journal of Social Sciences*, *20*(78), 988-1007. https://doi.org/10.17755/esosder.826045

Ekiçi, M., Öztürk, F., & Adalar, H. (2017). Prospective Social Studies Teachers' Opinions on Intelligence Games. *Researcher Social Science Studies*, *5*(IV), 489-502.

Esen, M. (2019). *Investigation of the Effect of Zekâ Games on 4th Grade Students' Decision- Making Skills Related to Problem Solving, Patience Behavior and School Doyum* [Master's Thesis]. Mersin University Institute of Educational Sciences.

Gabrito, R. C., Ibañez, R. Y., & Velza, J. F. P. (2023). Impact of Online Gaming on the Academic Performance of DEBESMSCAT-Cawayan Campus Students. *Scientific Journal of Informatics*, *10*(4), 423-434. https://doi.org/10.15294/sji.v10i4.45007/

Gençay, Ö. A., Gür, E., Gençay, S., Gür, Y., Tan, M., & Gençay, E. (2019). The Effect of Intelligence Games on Aggression Behaviors of 12-15 Year Old Children. *Journal of Sport Education*, *3*(1), 36-43.

Güneş, D., & Yünkül, E. (2021). Classroom Teachers' Evaluations on the Use of Mind and Intelligence Games in Primary School. *International Journal of Academy of Social Sciences*, *3*(5), 784-803. https://doi.org/10.47994/usbad.893591

Ikhianosime, F. E., & Akalue, A. I. (2021). Conceptualizing the Mind in Western Philosophical Tradition. *AMAMIHE: Journal of Applied Philosophy*, *19*(1), 82-95. https://doi.org/10.13140/RG.2.2.36675.73766

Kaleci, F. (2018). *Application and Effectiveness of In-Service Training Program for Integration of Information and Communication Technologies into Mathematics Education Process* [Doctoral Dissertation]. Necmettin Erbakan University Institute of Educational Sciences.

Kama Yılmaz, Ş. (2019). *Teachers' Opinions on Elective Zekâ Games Course* [Master's Thesis]. Balıkesir University Institute of Science and Technology.

Kel, S., & Kul, B. (2021). Contributions of Mind and Intelligence Games to Students: Opinions of Educators. *International Journal of Science and Education*, *4*(3), 207-225. https://doi.org/10.47477/ubed.840868

Ketamo, H. (2013). Learning Analytics with Games Based Learning. In P. Escudeiro & C. DeCarvalho (Eds.), *Satakunta University of Applied Sciences* (pp. 284-289).

Kumar, D.P., Deepa. S.D., & Bhoomika, A.V. (2023). Effect of Brain Games and Physical Activity in the Improvement of Academic Performance in School Children-A Comparative Study. *Korean Journal of Physiology and Pharmacology*, *27*(4), 618- 623. http://kjppor.com/index.php/kjpp/article/view/411

Koklu, N., & Sulak, S. A. (2021). World geography with augmented reality. International Journal of Progressive Sciences and Technologies, 29(1), 94-108.

Kurupınar, A., & Aydoğan, Y. (2020). Development of the Attitude Scale Towards Intelligence Games (ZOTÖ): Validity and Reliability Study. *Turkish Studies- Educational Sciences*, *15*(6), 4383-4400. https://doi.org/10.47423/TurkishStudies.46454

Marangoz, D., & Demirtaş, Z. (2017). The Effect of Mechanical Intelligence Games on the Mental Skill Levels of Primary School 2nd Grade Students. *Journal of International Social Research*, *10*(53), 612-621. https://doi.org/10.17719/jisr.20175334149

Meijering, B., Taatgen, N., Verbrugge, R., Wierda, S., & van Rijn, H. (2018). Stepwise Training Supports Strategic Second Order Theory of Mind in Turn Taking Games. *Judgment and Decision Making*, *13*(1), 79-98. https://doi.org/10.1017/S1930297500008846

Perinbanayagam, R. S. (2006). *Games and Sport in Everyday Life: Dialogues and Narratives of the Self* (C. 37). Paradigm Publishers. https://doi.org/10.4324/9781315634555

Saygı, E., Umay, A., & Alkaş Ulusoy, Ç. (2016). Primary Mathematics Teachers' Opinions on Intelligence Games Course. *Hacettepe University Journal of Education*, *32*(2), 280-294. https://doi.org/10.16986/HUJE.2016018494

Sulak, S. A., & Koklu, N. (2024). Analysis of Depression, Anxiety, Stress Scale (DASS-42) With Methods of Data Mining. European Journal of Education, e12778. https://doi.org/10.1111/ejed.12778

Şanlidağ, M., & Aykaç, N. (2021). The Effect of Intelligence Games Course on Students' Mathematics Problem Solving Attitudes and Reflective Thinking Skills Towards Mathematics Problem Solving. *Muğla Sıtkı Koçman University Journal of Faculty of Education*, *8*(2), 597-611. https://doi.org/10.21666/muefd.846312

Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics* (Sixth Edition). Pearson.

Turkish Language Association TDK Dictionary. (2023). https://sozluk.gov.tr/?kelime=zekâ

Türkoğlu, B., & Uslu, M. (2016). The Effect of Game-Based Cognitive Development Program on Cognitive Development of 60-72 Month Old Children. *International Journal of Educational Sciences*, *3*(6), 50-68.

Vlachopoulos, D., & Makri, A. (2017). The Effect of Games and Simulations on Higher Education: A Systematic Literature Review. *International Journal of Educational Technology in Higher Education*, *14*(1), 1-33. https://doi.org/10.1186/s41239-017- 0062-1

Whitton, N. (2013). Games for Learning: Creating a Level Playing Field or Stacking the Deck? *International Review of Qualitative Research*, *6*(3), 424-439. https://doi.org/10.1525/irqr.2013.6.3.424

Williams, C. (2007). Research Methods. *Journal of Business & Economic Research*, *5*(3), 65- 72. https://doi.org/10.19030/jber.v5i3.2532

Yağlı, M. C. (2019). *Zeka Oyunlarının İlkokul Öğrencilerinin Dikkat ve Görsel Algı Düzeylerine Etkisi [Intelligent games to the attention and visual perception levels of the primary school students]* [Master's Thesis]. Çanakkale Onsekiz Mart University Institute of Educational Sciences.

Yılmaz, Ş., & İkikardeş, N. Y. (2020). Secondary School Teachers' Opinions on the Intelligence Games Course. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education*, *14*(1), 528-576. https://doi.org/10.17522/balikesirnef.671642

Data Availability Declaration

Data Availability Upon Formal Request:

While the primary datasets utilized in this study are not publicly accessible due to certain constraints, they are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to the corresponding author. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Multiple Authors with Distinct Roles:

Author Contributions:

Süleyman Alparslan Sulak spearheaded the conceptualization, designed the research methodology, and supervised the entire project. Neslihan Erbaşı was responsible for the data collection, analysis, and interpretation, bringing analytical rigor to the study. Süleyman Alparslan Sulak took the lead in drafting the manuscript, ensuring its alignment with scholarly standards, and revising it for intellectual depth. All authors collaboratively discussed the results, provided critical insights, and contributed to the final manuscript. They have read, approved, and take joint accountability for the presented work's accuracy and integrity.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Statement of interest: We declare no conflicts of interest.

Funding: ***None***

Acknowledgements: ***None***

Biographical notes:

Neslihan Erbaşı was born in 1983 in Ankara, Turkey. She completed her primary, secondary, and high school education in Ankara. In 2006, she graduated with a bachelor's degree from the Department of Mathematics at the Faculty of Arts and Sciences, Kırıkkale University. In 2007, she completed her non-thesis master's degree in Mathematics Education at Başkent University. Since 2010, she has been working as a mathematics teacher. She is currently employed as a mathematics teacher at Konya Selçuklu Türk Telekom Vocational and Technical Anatolian High School and is also pursuing a master's degree in Curriculum and Instruction at the Institute of Educational Sciences, Necmettin Erbakan University.

Suleyman Alpaslan Sulak was born in 1975 in Balıkesir. He completed his primary, middle, and high school education in Konya. He earned his bachelor's degree in the Department of Electronics and Computer Education at Gazi University in 1999. Later, he began his academic career as a research assistant at Selçuk University. He completed his master's degree in the field of Computer Systems and his doctoral education in Curriculum Development in Education. He is currently working as a faculty member in the Department of Educational Sciences at Necmettin Erbakan University.

- Scopus Author Identifier Number: 59193058000
- Web of Science Researcher ID: HKO-3533-2023