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Research Paper

Predicting Academic Competitiveness of Elementary School Students Based on Hidden Curriculum and Problem-Solving Performance

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Abstract

Academic competitiveness is considered one of the factors influencing students' motivation, academic achievement, and engagement. Despite research attention to individual and environmental factors affecting academic performance, comprehensive information is lacking regarding the simultaneous role of the hidden curriculum and problem-solving performance in predicting academic competitiveness among elementary school students. Therefore, the present study aimed to predict elementary school students' academic competitiveness based on the hidden curriculum and problem-solving performance. This applied quantitative study employed a descriptive correlational design. The statistical population consisted of all second-cycle elementary school students in Ardabil in the 2024–2025 academic year, totaling 33,281 students. Based on Cochran's formula, 380 students were selected using convenience sampling. Data were collected using Franken and Brown (1995) Academic Competitiveness Questionnaire, Taghipoor and Ghaffari (2009) Hidden Curriculum Questionnaire, and Heppner and Petersen (1982) Problem-Solving Inventory (PSI). The data were analyzed using correlation and multiple regression analyses. The results showed that the hidden curriculum and problem-solving performance significantly predicted academic competitiveness ($p < 0.05$). Furthermore, the dimensions of the hidden curriculum, including the school's physical structure, social climate, school relationships, information and communication technology, and reward and punishment mechanisms, made significant contributions to predicting academic competitiveness. In addition, the dimensions of problem-solving performance, including problem-solving confidence, approach–avoidance style, and personal control, also made significant contributions to the prediction of academic competitiveness. Based on the findings, the hidden curriculum and problem-solving performance are key factors in shaping academic competitiveness. Educational administrators and planners' attention to improving the school environment and strengthening students' problem-solving skills can contribute to enhancing motivation and fostering healthy academic competition among students.

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Introduction

Academic competitiveness, as one of the motivational characteristics of students, plays an important role in determining their academic performance, individual achievement, and social interactions. This characteristic, which refers to an individual's tendency to excel and compare their abilities with those of others, can directly or indirectly influence students' academic success and the development of their cognitive skills (*Zimmerman, 2025*). Recent research has shown that academic competitiveness is not solely a product of internal factors but is also influenced by the educational environment, learning patterns, and characteristics of school curricula (*Li et al., 2024*; *Park et al., 2023*).

One of the key variables in this context is the hidden curriculum, which refers to the set of values, attitudes, norms, and informal educational experiences that students acquire through interactions with teachers, peers, and the school structure (*Myles et al., 2024*). The hidden curriculum can strengthen or weaken students' competitiveness by shaping their attitudes, expectations, and academic behaviors, and it plays an important role in their socialization and informal learning processes (*Sabnis et al., 2023*).

On the other hand, problem-solving performance, as a cognitive and skill-based ability that enables students to analyze situations, identify solutions, and make appropriate decisions, is considered one of the factors influencing academic competitiveness (*Korkmaz et al., 2020*; *Singh et al., 2023*). Students with stronger problem-solving abilities often have greater confidence when facing academic challenges and show a greater tendency toward healthy competition and the achievement of educational goals (*Zhu et al., 2024*).

Given the simultaneous importance of motivational and cognitive dimensions, the present study seeks to examine the relationships among the hidden curriculum, problem-solving performance, and academic competitiveness among elementary school students. Identifying these relationships can not only contribute to explaining students' motivational and cognitive processes but also provide strategies for improving educational environments, enhancing problem-solving skills, and managing healthy competition in schools (*Donovan et al., 2023*). The main objective of this study is to predict the level of students' academic competitiveness based on indicators of the hidden curriculum and problem-solving performance. Its findings may help teachers and educational planners create a more optimal learning environment and facilitate students' individual and social development (*Li et al., 2024*).

Students' position in curriculum planning within the educational system should be such that the needs, talents, and individual circumstances of each student are taken into account, thereby allowing for flexible curriculum planning that is appropriate to diverse abilities (*Aslan & Shiong, 2023*). Attention to students' active role in the learning process can enhance their motivation and academic success. Students' participation

in selecting learning topics and methods is also important (*Chang & Su, 2025*).

Competition among students can generate greater motivation and effort; however, in the absence of appropriate management, it may lead to psychological pressure and reduced self-confidence. Competition should therefore be guided in a manner that also encourages individual growth and cooperation (*Vrabie et al., 2025*). Academic competition among students in contemporary educational systems has become an important factor in determining individual and group success. On the one hand, such competition can foster motivation and effort toward the achievement of academic goals; on the other hand, the pressure associated with competition may generate stress and anxiety (*Veríssimo et al., 2024*).

The curriculum plays a determining role in students' academic competition because it establishes the level of competition by determining the content and degree of difficulty of learning materials (*Li et al., 2024*). If the curriculum is designed unfairly, it may direct competition toward unnecessary pressure and stress and deprive different students of equal opportunities. The hidden curriculum, through its embedded values, attitudes, and social skills, can foster either healthy or unhealthy competition and influence students' social interactions and academic success (*Park et al., 2023*).

Problem-solving performance refers to the ability to identify and analyze problems and find effective solutions. It involves the use of critical thinking skills, creativity, and various strategies to arrive at the best possible solution (*Popova et al., 2024*). Problem-solving performance plays a key role in developing students' intellectual abilities, as it enables them to respond to problems through analytical and creative thinking (*Schäfer et al., 2024*).

Academic competition can have a dual effect on problem-solving performance: healthy competition can increase motivation and effort in solving problems, whereas intense competition and the pressure associated with it may lead to anxiety and reduced self-confidence (*Tende & Deme, 2022*).

Academic competition among elementary school students can increase motivation, effort, and a sense of achievement and contribute to their individual development and social skills (*Mikalef et al., 2021*; *Tende & Deme, 2022*). Conversely, inappropriate competition or excessive pressure may generate anxiety and stress (*Veríssimo et al., 2024*).

The hidden curriculum encompasses values, attitudes, and skills that are transmitted to students informally and can contribute to strengthening healthy competition (*Donovan et al., 2023*). Problem-solving performance is also a fundamental skill for critical thinking, creativity, and effective responses to challenges (*Kärner & Schneider, 2024*).

Given that previous studies have primarily focused on academic competition and the formal curriculum, the role of the hidden curriculum and its relationship with problem-

solving performance among elementary school students has received comparatively less attention. Accordingly, the present study seeks to answer the following question: Can the hidden curriculum and problem-solving performance predict academic competitiveness among elementary school students?

Research Methodology

- Statistical Population

The statistical population of the present study consisted of all second-cycle elementary school students in Ardabil during the 2024–2025 academic year. The exact size of the statistical population was estimated at 33,281 students.

- Sampling Method and Sample Size

Based on Cochran's formula, 380 students were selected as the study sample using a non-probability convenience sampling method.

- Academic Competitiveness Questionnaire

The Academic Competitiveness Questionnaire was used to assess students' competitiveness. The questionnaire was developed by *Erikson (1975)* and consisted of 19 items covering five components: satisfaction derived from achieving improved performance, desire to win, motivation to exert effort in competitive situations, satisfaction derived from performing tasks as well as possible, and preference for difficult tasks. Three factors in the male group and four factors in the female group were found to be significant. Two factors were common to both groups and were labeled "desire to win" and "motivation to exert effort and compete." A significant positive correlation was observed between the second factor and academic achievement in both groups; however, no significant relationship was found between the "desire to win" factor and academic achievement. In the present study, the Cronbach's alpha coefficient for the Academic Competitiveness Questionnaire was 0.846.

- Hidden Curriculum Questionnaire

A standardized questionnaire developed by *Taghipoor and Ghaffari (2009)* was used to assess the hidden curriculum variable. The questionnaire consisted of 30 items and measured the hidden curriculum across five subscales, assessing students' perceptions of the hidden curriculum. The measurement scale was based on a six-point Likert scale, ranging from "very low" to "very high." The reliability coefficient of the questionnaire was 0.91 in the original study and 0.978 in the present study.

- Heppner Problem-Solving Inventory (PSI)

The Problem-Solving Inventory (PSI) consisted of 35 items and was designed based on a six-point Likert scale: 6 = strongly agree, 5 = agree, 4 = slightly agree, 3 = slightly disagree, 2 = disagree, and 1 = strongly disagree. *Heppner and Anderson (1985)* conceptualized problem solving as encompassing behavioral, cognitive, and affective responses. The inventory comprised three subscales: Problem-Solving Confidence (PSC; 11 items), Approach–Avoidance Style (AA; 16 items), and Personal Control (PC; 5 items).

- Procedure

After obtaining permission from the General Directorate of Education of Ardabil, the researcher visited elementary schools. The exact number of students was determined, and the sample size was calculated based on Cochran's formula. Participants were selected using a non-probability convenience sampling method. The questionnaires were distributed online via Google Forms. Following data collection, the data were entered into SPSS, and the analysis was conducted in three stages: demographic, descriptive, and inferential analyses.

- Data Analysis

Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to describe the distribution and characteristics of the data. To examine the relationships among the variables and test the research hypotheses, inferential statistics, including Pearson's correlation coefficient and multiple regression analysis, were employed. The assumptions underlying the statistical tests, including normality, multicollinearity, homogeneity, and independence of observations, were examined prior to the analyses to ensure the validity of the findings. All data analyses were conducted using SPSS version 28.

- Ethical Considerations

All participants were assured that the study was conducted solely for research purposes and would have no impact on their academic status. They were informed that providing their first and last names was not required and that all information would be kept strictly confidential. All participants provided informed and voluntary consent to participate in the study.

Results

- Assumption of Linearity

To assess the linearity of the relationships between the hidden curriculum and problem-solving performance as predictor variables and academic competitiveness as the criterion variable among elementary school students in Ardabil, scatterplots were used. The results are presented in the figure below

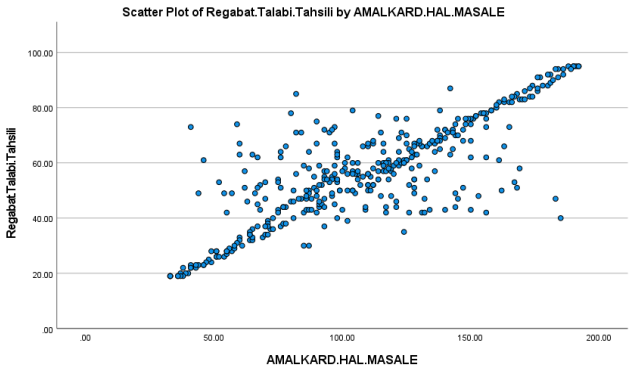

Figure 1. Scatterplot of the Descriptive Data for the Hidden Curriculum in Predicting Academic Competitiveness among Elementary School Students in Ardabil

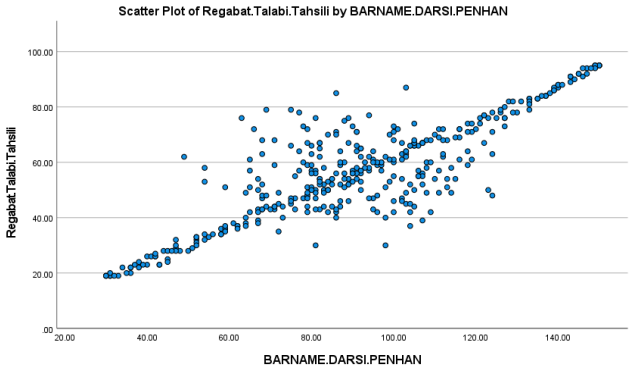

Figure 2. Scatterplot of the Descriptive Data for Problem-Solving Performance in Predicting Academic Competitiveness among Elementary School Students in Ardabil

Based on the information presented in the two figures above, the scatterplots of the descriptive data for the hidden curriculum and problem-solving performance in relation to the criterion variable, academic competitiveness, among elementary school students in Ardabil confirm the presence of linear relationships between the predictor and criterion variables. Therefore, the assumption of linearity was satisfied.

- Testing the Research Hypotheses

Main Hypothesis: Academic Competitiveness among Elementary School Students Can Be Predicted Based on the Hidden Curriculum and Problem-Solving Performance.

To examine whether academic competitiveness among elementary school students in Ardabil could be predicted based on the hidden curriculum and problem-solving performance, multiple linear regression analysis was conducted following confirmation of the assumptions underlying the regression analysis. The results are presented in the following tables.

Table 1. Regression Model Results for Predicting Academic Competitiveness among Elementary School Students in Ardabil Based on the Hidden Curriculum and Problem-Solving Performance

Model	Sum of Squares	df	Mean Square	F	Sig.
1 – Regression	97,542.976	2	48,771.488	582.017	0.001
Residual	31,591.580	377	83.797	—	—
Total	129,134.555	379	—	—	—

Based on the information presented in the table above, the significance level of the regression model is less than 0.05 (p<0.05). Therefore, the overall regression model was confirmed, indicating that the hidden curriculum and problem-solving performance can predict academic competitiveness among elementary school students in Ardabil. To further examine the predictive contribution of the hidden curriculum and problem-solving performance, the regression coefficients were examined. The results are presented in the following table.

Table 2. Predictive Contributions of the Hidden Curriculum and Problem-Solving Performance to Academic Competitiveness among Elementary School Students Based on Unstandardized and Standardized Coefficients

Model	Unstandardized Coefficients B	Standard Error	Standardized Coefficients Beta	t	Sig.
1 – Constant	5.994	1.564	—	3.832	0.001
Hidden Curriculum	0.375	0.028	0.583	13.315	0.001
Problem-Solving Performance	0.151	0.020	0.326	7.457	0.001

Based on the information presented in the table above, the predictive contribution of the hidden curriculum to academic competitiveness among elementary school students in Ardabil was 0.583 (Beta = 0.583), while that of problem-solving performance was 0.326 (Beta = 0.326). Both predictor variables the hidden curriculum and problem-solving performance made statistically significant contributions to predicting academic competitiveness (p<0.05). Furthermore, given the normal distribution of the data, Pearson's correlation coefficient was used to examine the relationships among the variables. The results are presented in the following table.

Table 3. Pearson Correlation Coefficients for Examining the Relationships among the Hidden Curriculum, Problem-Solving Performance, and Academic Competitiveness among Elementary School Students in Ardabil

Variables	Hidden Curriculum	Problem-Solving Performance	Academic Competitiveness
Hidden Curriculum	1	—	—
Problem-Solving Performance	0.813	1	—
Academic Competitiveness	0.848	0.800	1

Based on the information presented in the table above, the correlation coefficient between the hidden curriculum and problem-solving performance was 0.813, between the hidden curriculum and academic competitiveness was 0.848, and between problem-solving performance and academic competitiveness was 0.800. Since all of these coefficients were statistically significant at the 0.05 level, a positive and significant relationship among the three variables was confirmed (p<0.05).

Sub-Hypothesis 1: Academic Competitiveness among Elementary School Students Can Be Predicted Based on the Hidden Curriculum.

To examine whether academic competitiveness among elementary school students in Ardabil could be predicted based on the dimensions of the hidden curriculum, multiple linear regression analysis was conducted following confirmation of the assumptions underlying the regression analysis. The results are presented in the following table.

Table 4. Regression Model Results and Predictive Contributions of the Dimensions of the Hidden Curriculum to Academic Competitiveness among Elementary School Students in Ardabil

Model	Predictor	Unstandardized B	Standard Error	Standardized Beta	t	Sig.
2	Constant	7.008	1.672	—	4.191	0.001
	School Physical Structure	0.664	0.092	0.264	7.206	0.001
	School Social Climate	0.614	0.113	0.199	5.421	0.001
	School Relationships	0.609	0.089	0.238	6.854	0.001
	Information and Communication Technology	0.493	0.080	0.230	6.187	0.001
	Reward and Punishment Mechanism	0.371	0.091	0.147	4.088	0.001

Based on the information presented in Table 4, the significance level of the regression model was less than 0.05 (p<0.05). Therefore, the overall regression model was confirmed, indicating that the dimensions of the hidden curriculum can predict academic competitiveness among elementary school students in Ardabil. To further examine the predictive contributions of the dimensions of the hidden curriculum, the regression coefficients presented in Table 4 were examined.

According to the results presented in the table, the standardized predictive contributions to academic competitiveness among elementary school students in Ardabil were 0.264 for the school's physical structure (Beta = 0.264), 0.199 for the school's social climate (Beta = 0.199), 0.238 for school relationships (Beta = 0.238), 0.230 for information and communication technology (Beta = 0.230), and 0.147 for the reward and punishment mechanism (Beta = 0.147). All five dimensions of the hidden curriculum made statistically significant contributions to predicting academic competitiveness (p<0.05).

Sub-Hypothesis 2: Academic Competitiveness among Elementary School Students Can Be Predicted Based on Problem-Solving Performance.

To examine whether academic competitiveness among elementary school students in Ardabil could be predicted based on the dimensions of problem-solving performance, multiple linear regression analysis was conducted following confirmation of the assumptions underlying the regression analysis. The results are presented in the following table.

Table 5. Regression Model Results and Predictive Contributions of the Dimensions of Problem-Solving Performance to Academic Competitiveness among Elementary School Students in Ardabil

Model	Predictor	Unstandardized B	Standard Error	Standardized Beta	t	Sig.
3	Constant	14.566	1.622	—	8.983	0.001
	Problem-Solving Confidence	0.274	0.041	0.246	6.643	0.001
	Approach–Avoidance Style	0.299	0.031	0.375	9.704	0.001
	Personal Control	0.885	0.091	0.359	9.683	0.001

Based on the information presented in Table 5, the significance level of the regression model was less than 0.05 (p<0.05). Therefore, the overall regression model was confirmed, indicating that the dimensions of problem-solving performance can predict academic competitiveness among elementary school students in Ardabil. To further examine the predictive contributions of the dimensions of problem-solving performance, the regression coefficients presented in Table 5 were examined.

According to the results presented in the table, the standardized predictive contributions to academic competitiveness among elementary school students in Ardabil were 0.246 for problem-solving confidence (Beta = 0.246), 0.375 for approach–avoidance style (Beta = 0.375), and 0.359 for personal control (Beta = 0.359). All three dimensions of problem-solving performance made statistically significant contributions to predicting academic competitiveness (p<0.05).

Discussion and Conclusion

The main hypothesis of the study proposed that academic competitiveness among elementary school students could be predicted based on the hidden curriculum and problem-solving performance. The findings indicated that both predictor variables, namely the hidden curriculum and problem-solving performance, made significant contributions to predicting students' academic competitiveness, and these findings are consistent with previous research. For example, *Ghaderi et al. (2023)* showed that the hidden curriculum plays a fundamental role in developing social skills and creating the conditions for healthy competition. Similarly, *Nowrozi Chegini et al. (2017)* emphasized that the effects of the hidden curriculum directly and indirectly influence students' sense of school belonging, which can encourage them to exert greater effort and engage in constructive competition. On the other hand, *Seyedi Nazarloo et al. (2026)* and *Pourbaghban et al. (2019)* confirmed that the structured design of learning activities and the use of modern educational technologies have positive effects on strengthening problem-solving skills and academic achievement. These findings suggest that enhancing problem-solving performance can influence students' academic motivation and their inclination toward academic competition.

Findings from international studies also support these results. For example, *Schäfer et al. (2024)* reported that cognitive flexibility and working memory are essential components of successful scientific problem solving and may indirectly contribute to the development of a competitive academic orientation. Similarly, *Kärner and Schneider (2024)*, in reviewing the effects of the hidden curriculum, concluded that its consequences at both the individual and social levels can influence students' developmental trajectories in competitive and motivational contexts.

These findings can be explained by considering the hidden curriculum as a set of norms, values, and informal experiences that plays a key role in shaping students' competitive attitudes. The extent to which the

school climate is based on encouraging and valuing individual effort can strengthen academic competitiveness. At the same time, problem-solving performance, as a cognitive-behavioral skill, enables students to develop their analytical abilities and identify diverse strategies when confronted with challenges. This cognitive dynamism, as demonstrated by *Karimi (2022)* and *Ebrahim Pourkomaleh et al. (2016)*, contributes to increased academic achievement and enhanced intrinsic motivation.

The combination of these two factors the hidden curriculum and problem-solving performance creates conditions in which academic competitiveness can function as an intrinsic and constructive form of motivation. As demonstrated by *Rezaei Otorabad et al. (2021)*, negative competition can arise from external pressures; however, when problem solving is strengthened as a key strategy, academic competitiveness can take on a positive and growth-oriented character. From a theoretical perspective, these findings are consistent with constructivist learning approaches and motivational theories, which emphasize the role of social interactions and informal contexts in shaping tendencies such as academic competitiveness.

Sub-Hypothesis 1: Academic Competitiveness among Elementary School Students Can Be Predicted Based on the Hidden Curriculum

The findings of the study showed that the dimensions of the hidden curriculum can predict academic competitiveness among elementary school students in Ardabil. All five predictor dimensions school physical structure, school social climate, school relationships, information and communication technology, and reward and punishment mechanisms made significant contributions to the prediction of academic competitiveness. These findings are consistent with the study by *Ghaderi et al. (2023)*, which emphasized the multidimensional role of the hidden curriculum in the development of social skills. From their perspective, social skills emerge from interactions among the social climate, school structure, and relationships within the learning environment, all of which were also identified in the present study as influential indicators of academic competitiveness. Similarly, the findings of *Nowrozi Chegini et al. (2017)*, which showed that the hidden curriculum influences students' sense of school belonging and thereby contributes to the development of behaviors such as discipline and commitment to academic effort, are consistent with the findings of the present study.

The international study by *Atteh et al. (2023)* also emphasized that hidden-curriculum activities in elementary schools, by expanding learning opportunities and creating informal experiences in areas such as literacy and numeracy, can strengthen students' competitive motivation and inclination to exert greater effort. In the same vein, the study by *Kärner and Schneider (2024)* showed that the effects of the hidden curriculum can be observed at both individual and social levels and that the internalization of educational values and norms can create

conditions conducive to the emergence of behaviors such as positive competitiveness.

Sub-Hypothesis 2: Academic Competitiveness among Elementary School Students Can Be Predicted Based on Problem-Solving Performance

The findings indicated that the dimensions of problem-solving performance can predict academic competitiveness among elementary school students in Ardabil. Among the predictor variables, all three dimensions of problem-solving performance problem-solving confidence, approach–avoidance style, and personal control made significant contributions to predicting academic competitiveness.

This finding is consistent with the results of the study by *Seyedi Nazarloo et al. (2026)*, which showed that a curriculum model based on design-oriented understanding, with an emphasis on structured activities and valid assessments, enhances students' problem-solving skills and, consequently, improves their academic achievement. Similarly, the findings of *Karimi (2022)* confirmed that teaching learning strategies to students improves their performance in problem solving and that this effect remains stable over time. This suggests that enhancing problem-solving abilities plays an important role in strengthening students' motivation and persistence in academic efforts. Furthermore, the findings of *Pourbaghban et al. (2019)* regarding the positive effects of virtual reality-based instruction on components of problem-solving perception, including self-confidence and personal control, are consistent with the findings of the present study.

At the international level, *Schäfer et al. (2024)* demonstrated that working memory and cognitive flexibility are key components of successful scientific problem solving among elementary school students. The ability to shift between different stages of the problem-solving process while maintaining task requirements enhances students' performance and increases their willingness to exert effort and pursue achievement. Similarly, the study by *Rajkumar and Hema (2019)* emphasized that students' mathematical problem-solving competence is a determining factor in their success on competitive examinations and that the educational environment, as well as the roles of teachers and peers, can influence the level of this competence. Therefore, the findings of the present study underscore the importance of emphasizing problem-solving strategy instruction and strengthening its various dimensions to foster healthy competitiveness and academic motivation during elementary education.

- Practical Implications of the Study

Based on the findings of the present study, the following practical recommendations are proposed. Greater attention to the dimensions of the hidden curriculum in school design, including improving the physical structure, creating a positive social climate, strengthening teacher–student relationships, utilizing information and communication technologies, and developing appropriate reward and punishment mechanisms, can help

create an environment that enhances students' motivation and healthy academic competition. Furthermore, strengthening students' problem-solving skills through active, problem-based instructional methods and diverse practice activities can enhance their problem-solving confidence, personal control, and active orientation, thereby increasing their academic motivation.

The development of integrated educational programs that simultaneously incorporate formal and informal (hidden) activities can provide opportunities for the development of students' cognitive and social skills and engage them in positive and constructive competition. Training teachers and school administrators through workshops and professional development courses on motivation enhancement, healthy competition management, and the effective use of the hidden curriculum can contribute to improved academic productivity and the development of healthy competition among students. The use of innovative educational technologies, such as virtual reality, problem-solving software, and educational games, can also strengthen students' problem-solving skills and increase their motivation to participate in healthy competitive activities.

Developing enrichment programs for students with lower academic abilities as well as talented students, while taking individual differences into account, can provide opportunities for the development of cognitive abilities and healthy academic competition and help prevent the emergence of negative competition. Finally, effective communication with parents through providing information and training on the importance of healthy competition and supporting children's problem-solving skills can enhance students' motivation and effort while preventing undesirable family-related pressure.

- Ethical Considerations

All ethical principles were observed in this study. The participants were informed about the purpose of the study and the procedures involved in its implementation. They were also assured that their information would be kept confidential.

- Funding

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- Conflict of Interest

According to the authors' declaration, the present article has no conflict of interest.

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