I J C R M
International Journal of Contemporary Research In Multidisciplinary

Research Article

Mathematical Achievement of Secondary School Students in Relation to Their Type of School and Mathematical Anxiety

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DOI: https://doi.org/10.5281/zenodo.19047872

Abstract

Mathematics is a powerful tool for global communication, which enables the students to solve real and complex problem and excel in other areas also. Several socio-psychological elements, such as academic motivation, mathematical anxiety, study habits, parental education, concentration, self-efficacy, self-confidence, and academic stress, all have an impact on ' mathematical achievement of secondary school students. Out of these factors mathematics anxiety is most prominent as it is the feeling of tension, apprehension, or fear that interferes with mathematical performance. The present paper highlighted to explore the impact of mathematics anxiety and type of school on mathematical achievement of secondary school students.To achieve the objectives of the present study, a sample of 1518 secondary school students were selected by using a random sampling technique from different government as well as private schools affiliated to Himachal Pradesh Board of School Education, Dharamshala. Mathematics Achievement Test and Mathematics Anxiety Scale were used for collection of requisite data from the selected subjects. Statistically data was analysed by using two way Analysis of variance for 2x3 factorial design of the study i.e. two types of School i.e. Government and Privateand three level of mathematics Anxiety (i.e. high, average and low). Findings of the study revealed that type of school has significant effect on the mathematical achievement of secondary school students. Furthermore results indicated that mathematical anxiety has a significant effect on mathematical achievement of secondary school students. Type of school and mathematical anxiety (in combination with each other) were found to have significant interactional effect on mathematical achievement of secondary school students.

Manuscript Information

- **ISSN No:** 2583-7397
- **Received:** 09-01-2026
- **Accepted:** 28-02-2026
- **Published:** 16-03-2026
- **IJCRM:**5(2); 2026: 200-206

- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

How to Cite this Article

Devi S, Singh G. Mathematical Achievement of Secondary School Students in Relation to Their Type of School and Mathematical Anxiety. Int J Contemp Res Multidiscip. 2026;5(2):200-206.

Access this Article Online

www.multiarticlesjournal.com

KEYWORDS: Mathematical Achievement, Types of School and Mathematics Anxiety secondary school students.

1. INTRODUCTION

Conceptual Framework

Concept of Mathematical Achievement

Mathematics occupies a central position in school education as it develops logical reasoning, critical thinking, and problem-solving skills essential for academic and professional success. In the contemporary knowledge-based society, mathematical competence is considered a key indicator of educational quality and individual cognitive development. Mathematical achievement refers to the level of proficiency attained by students in mathematics as measured through standardized tests, classroom assessments, and board examinations. It reflects not only mastery of computational skills but also conceptual understanding, reasoning ability, and application of mathematical principles to real-life situations.

Researchers have consistently emphasized that mathematical achievement is influenced by cognitive, affective, and environmental factors. For instance, Benjamin Bloom (1956)[3] highlighted the role of cognitive processes in learning outcomes through his taxonomy of educational objectives, underscoring the progression from knowledge acquisition to higher-order thinking skills. In mathematics education, achievement is not limited to memorization of formulas but includes comprehension, application, analysis, and evaluation of mathematical concepts.

Despite its importance, mathematical achievement among secondary school students often shows considerable variation. These differences may arise due to institutional factors such as type of school, instructional strategies, teacher competence, and learning environment, as well as psychological variables *viz*; motivation, self-efficacy, and anxiety. Among these, mathematical anxiety has emerged as a critical affective determinant influencing performance outcomes.

Concept of Mathematical Anxiety

Mathematical anxiety is generally defined as a feeling of tension, apprehension, or fear that interferes with mathematical performance. In the words of Richardson and Suinn (1972)[9], who described mathematical anxiety as feelings of tension and anxiety that interfere with the manipulation of numbers and solving of mathematical problems in various academic and everyday situation.

Mathematical anxiety can act as a mediating variable between school environment and achievement. For example, a school that promotes interactive teaching methods, provides remedial support, and fosters positive teacher-student relationships may help reduce anxiety and enhance performance. On the other hand, schools that emphasize rote learning, strict evaluation, and comparison among peers may inadvertently increase anxiety levels.

Subsequent research has established that mathematical anxiety negatively affects working memory and cognitive processing. Ashcraft and Ridley (2005)[1] argued that anxiety consumes cognitive resources, thereby reducing the efficiency of problem-solving processes. Students who experienced high levels of anxiety, shifted their attention from task-focused thinking to worry and self-doubt, ultimately impairing performance. Thus, mathematical anxiety not only affects emotional well-being but also has direct consequences for academic achievement.

At the secondary school level, where mathematical concepts become more abstract and complex, anxiety may intensify. Board examinations, competitive academic environments, and parental expectations can further exacerbate anxiety levels. Therefore, understanding the relationship between mathematical anxiety and achievement becomes essential for improving educational outcomes.

Type of School as an Influencing Factor for Mathematical Achievement

Educational institutions differ in terms of management, infrastructure, teaching practices, curriculum implementation, and student support systems. In the Indian context, secondary schools are broadly categorized as government schools, private aided schools, and private unaided schools. These types of schools vary significantly in resources, class size, teacher-student ratio, monitoring systems, and academic culture.

The type of school can influence students' academic performance through differences in instructional quality, availability of learning materials, technological integration, and parental involvement. Private schools often provide enhanced facilities, structured academic schedules, and continuous assessment mechanisms, which may positively affect achievement. Conversely, government schools may face challenges such as limited resources and larger class sizes, potentially impacting learning outcomes.

However, the relationship between type of school and academic achievement is not always straightforward. Socioeconomic background, parental education, and student motivation often mediate this relationship. Moreover, the school environment also plays a role in shaping students' emotional experiences related to mathematics. A supportive and encouraging classroom climate may reduce anxiety, whereas a highly competitive or punitive environment may heighten it.

Therefore, examining mathematical achievement in relation to type of school allows researchers to identify institutional disparities and their implications for student learning. It also provides insights into whether differences in performance are attributable to structural factors or psychological variables such as anxiety.

Rationale and Need for the Study

The interplay between cognitive performance and emotional factors is well established in educational psychology. Albert Bandura (1997)[2] emphasized the role of self-efficacy beliefs in influencing academic outcomes. Students' perceptions of their abilities affect their emotional responses, effort, and persistence. In mathematics, negative self-perceptions may increase anxiety and reduce achievement.

Researches also indicate gender differences and socioeconomic influences in mathematical anxiety and achievement; however, institutional context remains a crucial determinant. By comparing students from different types of schools, the present

study seeks to explore whether variations in achievement levels are associated with differences in anxiety levels and institutional characteristics.

Understanding this relationship is particularly significant at the secondary level, where mathematics forms the foundation for higher education in science, technology, engineering, and mathematics (STEM) fields. Poor achievement due to anxiety may limit students' future academic and career opportunities. Therefore, identifying the combined influence of type of school and mathematical anxiety on achievement can help educators, policymakers, and administrators design targeted interventions. Although numerous studies have examined mathematical anxiety and achievement independently, relatively fewer investigations have simultaneously considered the institutional factor of type of school along with psychological variables. In the Indian educational context, disparities between government and private schools continue to raise concerns regarding quality and equity. Examining how these structural differences interact with students' emotional experiences in mathematics is essential for developing comprehensive improvement strategies. The present study aims to contribute to the existing body of knowledge by analyzing mathematical achievement of secondary school students in relation to their type of school and mathematical anxiety. The findings may help teachers adopt anxiety-reduction strategies, encourage positive mathematical attitudes, and create supportive learning environments. Furthermore, policymakers may utilize the results to bridge institutional gaps and promote equitable educational opportunities.

2. REVIEW OF RELATED LITERATURE

Carey *et al*. (2020)[4] examined the relationship between mathematics anxiety and mathematical achievement among secondary school students and reported that students who reported higher levels of anxiety tended to perform poorly in mathematics tests. Rozgonjuk, Kraav, Taht, and Mikkor (2020)[10] who experienced higher anxiety tended to obtain lower scores in mathematics-related tasks.Study conducted by Szczygieł (2020)[11]revealed that mathematics anxiety had a significant negative effect on mathematical achievement. Caviola*et al*. (2021)[5]investigated the influence of mathematics anxiety on mathematical achievement among middle school students. The findings indicated that mathematics anxiety was a significant negative predictor of mathematical achievement, even after controlling for other cognitive factors such as working memory and intelligence. Mammarella, Donolato, Caviola, and Giofrè (2021)[7]examined anxiety profiles and their association with mathematical achievement among primary school children. And found that students with higher levels of mathematics anxiety exhibited significantly lower levels of mathematical achievement, whereas students with lower anxiety and better emotional regulation performed significantly better in mathematics. Mutakin*et al*. (2023)[8]investigated factors influencing mathematics anxiety and its relationship with mathematical achievement among students at different educational levels and reported that higher levels of mathematics anxiety significantly reduced students' mathematical achievement. Md. K. Hossain *et al*. (2025) examine the impact of math anxiety and general anxiety on academic achievement among undergraduate students and confirmedthat higher math and general anxiety levels are linked to lower academic performance among undergraduate Bangladesh students.

3. OBJECTIVES OF THE STUDY

Keeping in mind the statement of problem following objectives has been formulated for the present investigation

1. To study the mathematical achievement of secondary school students with respect to their Types of school.
2. To study mathematical achievement of secondary school students in relation to their level of mathematical anxiety i.e. high, average and low.
3. To study the interactional effect of types of school and mathematical anxiety on mathematical achievement of secondary school students.

HYPOTHESES OF THE STUDY

1. Government and private secondary school students differ significantly in their mathematical achievement.
2. Students having different levels of mathematical anxiety differ significantly from each other with regards to mathematical achievement.
3. Types of school and Mathematical anxiety do not have significant interactional effects on mathematical achievement of secondary school students.

4. RESEARCH METHODOLOGY

This section presents the research methodology that was adopted in this study. It includes the research design, research respondents, sampling technique and procedure, research instruments, validity and reliability of the instruments, data gathering procedure, and the statistical treatment.

RESEARCH DESIGN

In present study the investigator follows the quantitative research design. Quantitative approach seeks correlation, relationships, and causality and focuses on gathering numerical data and generalizing it across groups of people or explaining a particular phenomenon. Descriptive survey method was adopted. In descriptive research, the researcher has been studying the phenomenon of interest as it exists naturally, no chance to manipulate the individuals, conditions, or events.

Population and Sample

The population for the current research included secondary school students studying in 9th grade of different government and private schools affiliated to Himachjal Pradesh Board of School Education, Dharamshala The sample consisted of 1518 secondary school students of both government and private (772 government and 746 private) was taken fromHamirpur, Mandi, Kullu and Bilaspur districts of Himachal Pradesh, India. The respondent's age group ranged from 13^{+} to 15years.

Sampling Techniques

In the present study, multi-stage Random sampling technique was used. In first stage four districts has been selected randomly by making use of lottery method. Further in second stage Government and private schools has been taken purposively from the sampled districts. In final stage, secondary school students were selected from each sampled government and private schools by making use of random numbers table.

Research Instruments

For the collection of requisite data in the present study, the investigator used two standardized tools namely; Mathematics Achivement Test for IXthgrade studentsby Imamand Khatoon (2012) and Mathematical Anxiety Scale by Mahmoodand Khatoon (2012) are used. Mathematics achievement test comprises 60 items of multiple choice objective type items. The split-half reliability of the tool was 0.89, test-retest reliability was 0.94. The possible minimum and maximum score on the test is 00 and 60 respectively. The mathematics anxiety scale comprises of 14 items out of which 07 items are positive and 07 items are negative. Each item was rated on a five point Likert scale ranging from 'Strongly agree' to 'Strongly Disagree'. The reliability of the test was calculated through the test-retest methodand coefficient of reliability is 0.87.

Data Gathering Procedure

The data for this study was collected between the21thapril to 30 rdDecember 2025. After taking the necessary permission from the principals of each sampled Government and private sampled schools, the investigator interacted with the subjects of the study. The purpose of the study was made clear to them and they were ensured that the information provided by them would be used for research purpose only. After this, the booklets of the mathematics achievement test and mathematics anxiety scale were distributed to students one by one and instructions were read out to them. Then students were asked to start responding to the items of the tools. Enough time was given to students to respond to all the items of the scales. The filled up booklets were collected and the students were thanked for the cooperation extended in the collection of the data.

Statistical Treatment

The data were analyzed by using the Statistical Package for the Social Sciences (SPSS).Mean and standard deviation were calculated to check the levels ofmathematical achievement and anxiety levels of students. In order to study the main and interactional effectsof types of school and level of mathematics anxiety on mathematical achievement of secondary schools, 2X3 analysis of variance (Two-way ANOVA) involving two types of Schools i.e. government and Private and three level of mathematics anxiety i.e. high, average and low) was applied.

5. RESULTS AND DISCUSSION

This section comprises the analysis, interpretation of the data and discussion of the findings of the study. In order to study the main effects of types of school and mathematics anxiety on mathematical achievement of secondary school students along with their interactional effects, analysis of variance (2X3 factorial design involving two types of school and three levels of mathematics anxiety, i.e., high, average, averageand low) was applied on mean scores of mathematical achievement.

The mean scores at different levels of types of school and mathematics anxiety are given in table-1 and figure-1 as under:

Table 1. Mean Scores of Mathematical Achievement of Secondary School Students at Different Levels of Mathematics Anxiety

Sr. No.	Types of School		Levels of Mathematical Anxiety			
			High	Average	Low	Total
1.	Govt.	Mean	26.03	28.61	30.01	28.61
		S.D.	9.66	9.99	9.30	9.84
		N	104	476	192	772
2.	Private	Mean	24.36	29.10	27.48	27.79
		S.D.	9.83	11.46	9.27	10.93
		N	162	456	128	746
3.	Total	Mean	25.01	28.85	28.99	28.21
		S.D.	9.78	10.73	9.36	10.39
		N	266	932	320	1518

Table-1 indicates the mean scores of government (28.61) and private (27.79) secondary school students on mathematical achievement. Further table depicts the mean scores of high mathematics anxiety (25.01), average (i.e. 28.85) and low anxiety (28.99) secondary school students with respect to their mathematical achievement.

The pictorial representation of mean mathematical achievement scores of government and private secondary students at different levels of mathematics anxiety is given below in Figure-1. as under:

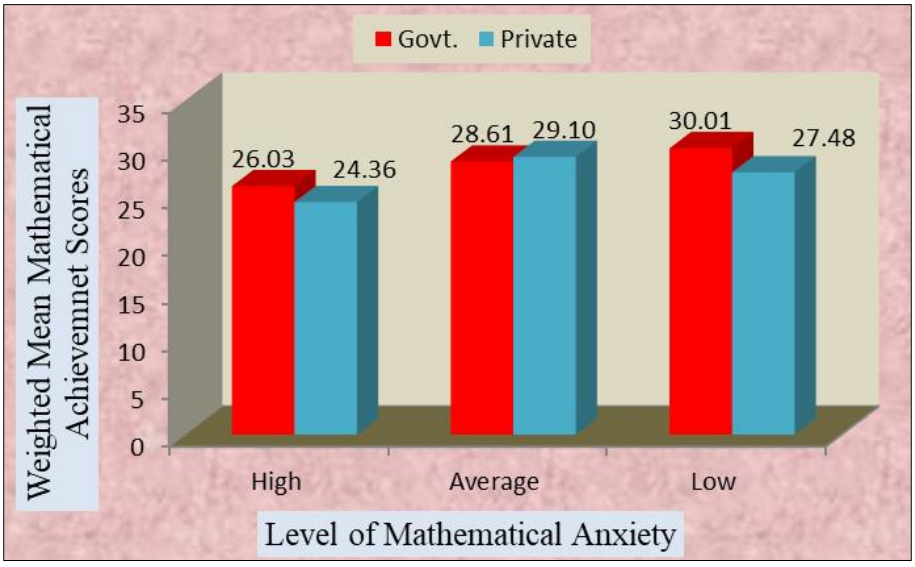

Fig 1: Bar Diagram Showing the Mean Scores of Government and Private Secondary School Students at different Levels of Mathematics Anxiety with regard to Mathematical Achievement

The complete summary of the 2X3 analysis of variance is given in Table-2 as follows:

Table 2: The complete summary of the 2X3 Analysis of Variance for mathematical achievement scores of Secondary School Students

Sr. No.	Source of Variation	Sum of Squares	*df*	Mean Squares of Variance	'F' Value
1	Type of School (A)	414.115	1	414.115	3.917**
2	Mathematical Anxiety(B)	2778.409	2	1389.205	13.139**
3	Interaction AXB	634.632	2	317.316	3.0001*
4	Error Variance	159870	1512	105.735	
5	Total	163893.964	1517		

**Indicates significant at 0.01 level of significance
Table value for *df*1/1512=3.84 and 2/1512= 2.99 at 0.05 level of significance
Table value for *df*1/1512=6.64 and 2/1512= 4.60 at 0.01 level of significance

Mathematical Achievement of Secondary School Students In Relation to Their Type of School

Table-2 indicates that the 'F' value forfor the main effect of type of school on mathematical achievement of secondary school students, irrespective of their mathematical anxiety, for *df* 1 and 1512, came out to be 3.917, which is higher than the table value of (3.84) at the 0.05 level of significance. Hence, Hypothesis no. 1 that**,** "Government and private secondary school students will not differ significantly with regard to their mathematical achievement "was not retained. It can be inferred that government and private secondary school students differ significantly in terms of their mathematical achievement. In other words, It can be said that type of school has significant effect on mathematical achievement of secondary school students. It is evident from the mean Table-1 that the total weighted mean scores for government and private secondary school students came out to be (28.61) and (27.79) respectively. Thus, from the analysis it may be concluded that government secondary school students exhibited higher level of mathematical achievement in comparison to private counterparts. The study was contradicted by the findibgs of Venkatarao (2022) who reported that government school students have exhibited lower achievement in mathematics than those studying in private schools.

Mathematical Achievement of Secondary School Students In Relation to Their Level of Mathematical Anxiety

Table-2 evident that the computed F-value for the main effect of mathematical anxiety on mathematical achievement of secondary school students, irrespective of their type of school, for *df*2 and 1512, came out to be 13.139, which is much higher than table value (4.60)at 0.01 level of significance. Hence, Hypothesis no. 2 that**,** "Students having different levels of mathematical anxiety differ significantly from each other with regards to mathematical achievement." was retained. It can be inferred that mathematical anxiety has a significant effect on mathematical achievement of secondary school students. It is evident from the mean Table-1 that the total weighted mean scores for high, average and low mathematical anxiety secondary school students came out to be(25.01), (28.85) and (28.99) respectively. From the above analysis it may be concluded that secondary school students having low level of mathematical anxiety possessed high mathematical achievement as compared to students having average and high mathematical anxiety level.

This finding is substantiated by the result of Bhan &Kumar (2023), Kuhl, Elliott, and Guo (2023), Rani, B., & Rani, S. (2024), Lalsangpuii, C., &Zohmingliani, L. (2024), Szőcs & Árvay (2024)they also found that students having lower level of mathematics anxiety performed better academically.

Interactional Effect of Type of School × Mathematical Anxiety on Mathematical Achievement of Secondary School Students

Table-2 evident that the calculated value of 'F' for the interaction effect of type of school and mathematical anxiety on mathematical achievement of secondary school students, for *df*2 and 1512 came out to be 3.001 which is higher than table value (2.99) at 0.05 level of significance. Hence, Hypothesis no. 3 that **"**Types of school and Mathematical anxiety do not have significant interactional effects on mathematical achievement of secondary school students. **"** was not retained. This indicated that type of school and academic achievement (in combination with each other)significantly affect the mathematical achievement of secondary school students. Therefore, it may be interpreted that the magnitude of the difference in mathematical achievement scores of government and private secondary school students is not same within the limits of random variation at different level of mathematical anxiety i.e. high, average and low. The significant interactional effect of type of school and mathematical anxiety on mathematical achievement of secondary school students is shown in Figure-2

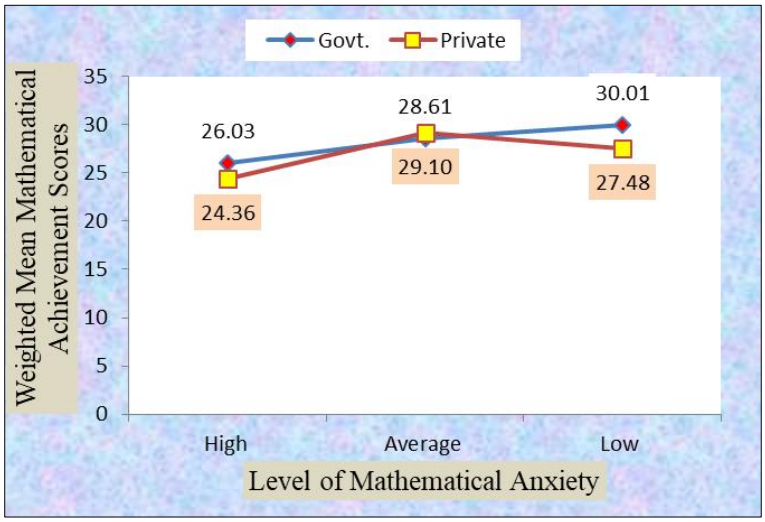

Fig 2: Interactional Effect of Type of School and Mathematical Anxiety on Mathematical Achievement of Secondary School Students

Figure-2 shows that the mean scores of governmentsand private secondary school studentswith high anxiety level i.e. 26.03 and 24.36, followed by average 28.61 and 29.10 and low mathematics anxiety30.01 and 27.48respectively. These differences are not same within the limits of random variations in mathematics anxiety i.e. high, average and low. From the above analysis it may be said that types of school and mathematics anxiety (in combination with each other) significantly affected the mathematical achievement of secondary school students.

RECOMMENDATION

The present study explored the main and interactional effects of types of school and mathematics anxiety on mathematical achievement of secondary school students. On the basis of the findings of the present study following educational implications have been made:

Mathematics teachers must be create supportive learning environment and help their students to overcome math anxiety. A supportive environment reduces fear and helps students engage more confidently in mathematical activities. Mathematics instruction should incorporate hands-on activities, experiments, and practical demonstrations. Activity-based learning makes abstract mathematical concepts easier to understand and increases students' interest in the subject. Teachers should be used appropriate methods from the foundation stage with concept clarity so that they take mathematics as a enjoyable subject that leads them to boost their confidence in mathematics achievement. Teacher should be organised collaborative learning, and provide real-world applications, and environments that are error-friendly have proven to be successful in lowering anxiety levels and increasing student engagement. Teachers should beidentify those students who experienced high levels of mathematics anxiety and provide them with additional support and guidance that can help learners to overcome specific difficulties in mathematics.

6. CONCLUSIONS

In conclusion, mathematical achievement is a multifaceted construct influenced by cognitive, emotional, and environmental factors. Mathematical anxiety significantly affects students' performance, while the type of school provides the contextual framework within which learning occurs. Investigating their interrelationship is crucial for enhancing mathematics education and fostering academic success among secondary school students.

REFERENCES

1. Ashcraft MH, Ridley KS. Math anxiety and its cognitive consequences: A tutorial review. Psychological Bulletin. 2005;131(2):181–207.
2. Bandura A. Self-efficacy: The exercise of control. New York: W H Freeman; 1997.

3. Bloom BS. Taxonomy of educational objectives: The classification of educational goals. New York: Longmans, Green; 1956.
4. Carey E, Hill F, Devine A, Szűcs D. The chicken or the egg? The direction of the relationship between mathematics anxiety and mathematics performance. Frontiers in Psychology. 2020;11:573204.
5. Caviola S, Mammarella IC, Cornoldi C, Lucangeli D. Mathematics anxiety and mathematics achievement in middle school students. Learning and Individual Differences. 2021;85:101948.
6. Ma X. A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. Journal for Research in Mathematics Education. 1999;30(5):520–540.
7. Mammarella IC, Donolato E, Caviola S, Giofrè D. Anxiety profiles and mathematics achievement among primary school children. Learning and Individual Differences. 2021;85:101948.
8. Mutakin F, Munali M, Dewi N. Analysis of mathematics anxiety among students using Rasch measurement model. Al-Ishlah: Jurnal Pendidikan. 2023;15(1):341–350.
9. Richardson FC, Suinn RM. The mathematics anxiety rating scale: Psychometric data. Journal of Counseling Psychology. 1972;19(6):551–554.
10. Rozgonjuk D, Kraav T, Täht K, Mikkor K. Mathematics anxiety among university students and its relationship with academic performance. International Journal of STEM Education. 2020;7(1):1–10.
11. Szczygieł M. When does mathematics anxiety predict mathematics achievement? Educational Psychology. 2020;40(2):1–18.

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