Exploring Differences in Academic Priorities: A Comparison of Turkish and Singaporean Mathematics Teachers' Responses to TIMSS 2019

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Abstract: This research aims to compare the responses of Turkish and Singaporean mathematics teachers to school emphasis on academic success questions. The research was conducted following the causal-comparative design. The research study group consists of Turkish and Singaporean eighth-grade mathematics teachers who participated in the 2019 TIMSS. The data collection tool used in this study consisted of survey items directed to teachers under the "School Emphasis on Academic Success" category in the 2019 TIMSS. The Cronbach's alpha coefficient was calculated as 0.89 for the Singaporean sample and 0.90 for the Turkish sample. Independent samples t-test was used to compare the averages of the scores obtained from the survey items of Turkish and Singaporean teachers. According to the results obtained, Singaporean teachers expressed more positive views about their schools regarding teachers' expectations for student achievement, parental involvement in school activities, parental support for the instructional process, students' desire for success, and students' ability to reach academic goals compared to Turkish teachers. On the other hand, Turkish teachers expressed more positive views about their schools regarding the ability of teachers to inspire students and the collaboration among teachers for planning instruction compared to Singaporean teachers. The results showed that Turkish and Singaporean education systems have different priorities and emphases.

Keywords: TIMSS 2019, School Emphasis on Academic Success, Singaporean and Turkish Mathematics Teachers.

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Introduction

Teachers have an essential role in education systems. The education system is a system that shapes students' lives and has a significant influence on their future success. Therefore, it is inevitable for teachers to play an essential role in the education system especially by providing student-centered activities such as peer learning learning to foster students' competences e.g. critical thinking, reasoning and argumentation (see Acikgoz & Akman, 2023; Demirbilek, 2022; Eski & Akman, 2023; Latifi et al., 2021, 2023; Noroozi et al., 2012, 2018, 2020; Ozturk, 2023; Ozturk & Susuz, 2023; Valero-Haro et al., 2019, 2022). The importance of teachers for the

education system stems from the fact that they are one of the most critical factors in students' learning process. Studies show that teachers significantly impact students' academic success, attitudes, and behaviors (Hattie, 2003; Darling-Hammond, 2006). However, teachers have an important role in the education system because not only the students' academic success. Teachers are also responsible for responding to students' social, emotional, and psychological needs. Teachers' guidance and support can significantly affect students' self-confidence, self-esteem, and emotional well-being (Sklad et al., 2012).

As a result, teachers are of great importance to the education system. They are crucial in many factors that affect students' lives and determine their future success. Teachers' influence on students' academic achievement, attitudes, and behavior is only one aspect. They are also responsible for responding to students' social, emotional and psychological needs. This research aims to compare the answers given by Turkish and Singaporean mathematics teachers to questions about school success. This comparison can help better understand the differences and similarities between the Turkish and Singaporean education systems.

Trends in International Mathematics and Science Study (TIMSS)

Trends in International Mathematics and Science Study (TIMSS) is an exam organized by the International Association for Educational Evaluation (IEA) measuring students' mathematics and science success. TIMSS contributes to the evaluation of education policies and practices by measuring the achievement levels of students in mathematics and science subjects based on essential knowledge and skills (IEA, 2021). TIMSS is implemented in many countries around the world.

TIMSS, organized for the first time in 1995, is repeated every four years. The latest version of TIMSS is TIMSS 2019. Countries participating in TIMSS may vary with each release. For example, 64 countries and territories participated in TIMSS 2019. Countries participating in TIMSS collect data on students' learning environments, teaching practices, and students' views on the learning process, as well as students' knowledge and skills in mathematics and science (MoNE, 2020).

TIMSS results provide much valuable information for the education systems of the participating countries. For example, the results reveal students' achievement levels in mathematics and science, helping countries identify their strengths and weaknesses in these areas. In addition, TIMSS results are used to measure and improve the effectiveness of education policies and practices. These results also help develop teacher education and training programs (Badri, 2019; Mullis et al., 2020; Utomo, 2021).

In addition to the TIMSS exams, surveys are also administered to teachers. TIMSS teacher surveys measure teachers' views and experiences regarding education systems, teaching methods, and students' learning levels. TIMSS teacher questionnaires include teachers' assessments of teaching methods, materials, class times, classroom environment, student-teacher interaction, and students' learning levels (IEA, 2018).

TIMSS teacher questionnaires cover teaching methods and materials teachers apply in their classrooms, student-teacher interactions, students' learning levels, and classroom environment (Mullis et al., 2021). The questionnaires also address teachers' views on education systems, the factors that affect students' success, and the challenges in education systems. Education system decision-makers and researchers use TIMSS teacher surveys to help gather information about teachers' views and experiences. These data can be used to identify the strengths and weaknesses of education systems, contribute to developing education policies, and improve teacher education.

Turkish Education System

The Turkish education system consists of 4 main stages: Kindergarten, Primary School, Secondary School, and High School. Education in Turkey is compulsory and free of charge. In the 2022-2023 academic year, the age to start primary school first grade from 5 has been increased to 6 in the applied system. The curriculum determined by the Ministry of National Education (MEB) is applied in the Turkish education system. The education system is based on the central examination system, and students can progress with a specific examination each year. According to the results of the High School Entrance Examination (LGS) held in the last year of high school, students continue their high school education or go to vocational high schools (Parlak, Yildirim & Özdemir, 2019).

Teachers are one of the essential elements in the educational process of students. Teachers' professional competencies are determined in line with the standards set by the Ministry of National Education. Teachers are responsible for planning, implementing, and evaluating students' education. In addition, it is among the teachers' duties to meet students' social and emotional needs, to ensure that students are in a safe learning environment, to set an example for students, and to motivate them (MoNE, 2017).

In recent years, increasing teachers' professional competence has gained importance in the Turkish education system. In this direction, vocational training and development programs are organized to increase the quality of teachers. Teachers are expected to use different learning styles, materials, and methods to meet students' learning needs. In addition, teachers' professional competencies are also regularly evaluated, and additional training is provided when necessary (MoNE, 2017).

Singapore Education System

The Singapore education system is a highly-performing education system worldwide. The education system has a structure that extends to primary, secondary, and university education. It has three levels: primary, secondary, and high. The education system implements a rigorous curriculum to ensure students have an excellent academic background (MOE, 2019). The Singapore education system takes a multidisciplinary approach to ensure students perform at the highest possible level. The main features of this system include discipline, hard work, high expectations, continuous assessment, and student-centered learning (Toh et al., 2019).

In the Singapore education system, teachers are responsible for monitoring students' academic achievement and personal development. Teachers perform tasks such as identifying students' needs, teaching students learning strategies, supporting students' learning process, collaborating with parents, and using educational technologies (MOE, 2012). The Singapore education system applies rigorous examinations and evaluations to determine teachers' professional competence. Teacher qualifications are determined based on various factors, including teacher training programmes, teacher training, teachers' performance, and student feedback. Teachers' professional qualifications are continuously developed to improve the quality of education (MOE, 2019).

Purpose of the Research

This study compares Turkish and Singaporean mathematics teachers' responses to school success-oriented questions using TIMSS 2019 data. This comparison will help better understand the differences and similarities between the Turkish and Singaporean education systems. The research results will help Turkish and Singaporean education system decision-makers, teachers, and researchers identify and improve their education systems' weak points. It will also provide a basis for comparing education systems in other countries. The results of this research will help us better understand the impact of education systems and teaching methods on students' academic achievement. This, in turn, will contribute to developing better education policies and teaching methods, and ultimately help raise more successful students.

Method

This research was conducted under the causal comparison design. The causal comparison model is a model used to examine the causal relationship between two or more variables. This model determines the nature and direction of the relationship between variables and measures the effect of one variable on other variables (Gürbüz & Şahin, 2014). Following the research purpose, the answers given by Turkish and Singaporean mathematics teachers to the questions related to School Emphasis on Academic Success were compared and examined.

Sample

The research study group consists of Turkish and Singaporean eighth-grade mathematics teachers participating in the 2019 TIMSS. 306 Singaporean and 181 Turkish mathematics teachers participated in the 2019 TIMSS. Singaporean teachers' average professional experience is 11.16 years (SD=8.04). The average professional experience of Turkish teachers is 10.15 years (SD=6.68). The distribution of teachers by demographic characteristics is shown in Tables 1, 2, and 3.

When Table 1 is examined, it is understood that 60.1% of Singaporean teachers are female and 39.9% are male. On the other hand, 53.6% of Turkish teachers are female, and 45.9% are male. It was observed that the

distribution by gender was similar in both countries.

Table 1. Distribution of Turkish and Singaporean Teachers by Gender

			Frequency	Percent
Gender of teacher	Singaporean	Female	184	60.1
		Male	122	39.9
	Turkish	Female	97	53.6
		Male	83	45.9
		Missing	1	0.6

When Table 2 is examined, it is understood that the majority of Singaporean teachers are in the 25-29 (18%), 30-39 (45.1%), and 40-49 (25.2%) age groups. The majority of Turkish teachers are also in the 25-29 (29.3%), 30-39 (44.2%), and 40-49 (18.2%) age groups. It has been observed that Turkish teachers participating in TIMSS are younger.

Table 2. Distribution of Turkish and Singapore Teachers by Age

			Frequency	Percent
Age of teacher	Singapore	Under 25	2	0.7
		25–29	55	18.0
		30–39	138	45.1
		40–49	77	25.2
		50–59	25	8.2
		60 or more	9	2.9
	Turkey	Under 25	10	5.5
		25–29	53	29.3
		30–39	80	44.2
		40–49	33	18.2
		50–59	3	1.7
		Missing	1	1.2

When Table 2 is examined, most Singaporean teachers (81.7%) have a bachelor's degree. Similarly, many Turkish teachers stated they have a bachelor's degree (92.8%). While 18% of Singaporean teachers are

graduates, this rate is 6.6% for Turkish teachers.

Table 3. Distribution of Turkish and Singapore Teachers by Education Level

			Frequency	Percent
Education level of teacher	Singapore	Post-secondary, non-tertiary education	1	0.3
		Bachelor's or equivalent level	250	81.7
		Master's or equivalent level	55	18.0
	Turkey	Bachelor's or equivalent level	168	92.8
		Master's or equivalent level	12	6.6
		Missing	1	0.6

Measuring Tool

TIMSS (Trends in International Mathematics and Science Study) is a program that measures the quality of mathematics and science education worldwide. TIMSS aims to measure the knowledge and skills students acquire in mathematics and science and evaluate the effectiveness of education systems. For this purpose, questionnaires are applied to teachers in addition to TIMSS exams. TIMSS teacher surveys measure teachers' views and experiences regarding education systems, teaching methods, and students' learning levels. TIMSS teacher questionnaires include teachers' assessments of the teaching methods, materials, class times, classroom environment, student-teacher interaction, and students' learning levels that they apply in their classrooms (IEA, 2018).

This research used questionnaire items directed to teachers under the title of "School Emphasis on Academic Success" in 2019 TIMSS (IEA, 2018). In the survey, "How would you characterize each of the following within your school?" With the question, teachers are asked to evaluate their colleagues, school administration, school environment, and students. The questionnaire is in a 5-point Likert type (Very high=1, High=2, Medium=3, Low=4, Very low=5) and consists of 12 items. The scores given to the items were reversed so that high scores indicate positive results. For the Singapore sample, the Cronbach's alpha coefficient was 0.89; For the Turkish sample, the Cronbach's alpha coefficient was calculated as 0.90. Accordingly, it can be said that the internal consistency of the answers given to the items is at a high level.

Statistical Analysis

TIMSS 2019 User Guide was used to analyze the data (Fishbein, Foy & Yin, 2021). The skewness and kurtosis coefficients were calculated to examine the distribution of the answers given to the questionnaire items related to School Emphasis on Academic Success. In order to meet the assumption of normal distribution, it is sufficient that the skewness and kurtosis coefficients are in the range of ±1.5 (Tabachnick & Fidell, 2007). The

calculated coefficients are within the specified range.

Independent groups t-test was used to compare the mean scores of Turkish and Singaporean teachers. Cohen d values were calculated to determine the effect size. In general, d = 0.2 indicates a "small" effect size, d = 0.5 a "moderate" effect size, and d = 0.8 a "large" effect size (Cohen 1988). Analyzes were carried out using the SPSS 25.0 statistical package program.

Results

In accordance with the purpose of the research, independent groups t-test was applied to compare the answers given by Turkish and Singaporean mathematics teachers to the questionnaire items related to School Emphasis on Academic Success. Obtained results are shown in Table 4.

Table 4. Comparison of the Mean Scores of Turkish and Singaporean Mathematics Teachers from the School Emphasis on Academic Success Questionnaire.

School Emphasis on Academic Success Items	Country	N	M	SD	*t*(484)	p	Cohen *d*
Teachers' understanding of the school's curricular goals	Singapore	306	4.09	0.58	-1.13	0.26	0.10
	Turkey	180	4.16	0.70			
Teachers' degree of success in implementing the school's curriculum	Singapore	306	3.92	0.55	-1.58	0.11	0.14
	Turkey	180	4.01	0.74			
Teachers' expectations for student achievement	Singapore	306	4.00	0.64	4.27	0.00*	0.39
	Turkey	180	3.72	0.83			
Teachers' ability to inspire students	Singapore	305	3.75	0.63	-2.70	0.01*	0.25
	Turkey	180	3.92	0.77			
Parental involvement in school activities	Singapore	306	3.08	0.91	4.47	0.00*	0.41
	Turkey	179	2.68	1.06			
Parental commitment to ensure that students are ready to learn	Singapore	306	3.13	0.87	7.51	0.00*	0.69
	Turkey	180	2.46	1.08			
Parental expectations for	Singapore	306	3.81	0.78	1.32	0.19	0.12

student achievement							
	Turkey	180	3.70	1.00			
Parental support for student achievement	Singapore	306	3.24	0.81	8.17	0.00*	0.75
	Turkey	180	2.56	1.00			
Students' desire to do well in school	Singapore	306	3.42	0.86	3.01	0.00*	0.28
	Turkey	180	3.18	0.84			
Students' ability to reach school's academic goals	Singapore	306	3.29	0.73	3.30	0.00*	0.31
	Turkey	180	3.06	0.74			
Students' respect for classmates who excel academically	Singapore	306	3.60	0.70	1.24	0.22	0.11
	Turkey	180	3.51	0.89			
Collaboration between school leadership (including master teachers) and teachers to plan instruction	Singapore	306	3.65	0.84	-3.85	0.00*	0.36
	Turkey	180	3.94	0.80			

When the Table 4 is examined, "Teachers' understanding of the school's curricular", "Teachers' degree of success in implementing the school's curriculum", "Parental expectations for student achievement" and "Students' respect for class who excel academically" score averages did not show a significant difference according to the countries ($p>0.05$). Singaporean and Turkish teachers expressed similar opinions about their schools regarding the level of teachers' understanding of the school's curriculum goals, teachers' success in implementing the school curriculum, parental expectations for student success, and their students' level of respect for their classmates.

In addition, "Teachers' expectations for student achievement", "Teachers' ability to inspire students", "Parental involvement in school activities", "Parental commitment to ensure that students are ready to learn", "Parental support for student achievement", "Students' desire to do well in school Students' ability to reach school's academic goals", "Collaboration between school leadership and teachers to plan instruction" score averages showed a significant difference according to the countries. ($p<0,05$). Compared to Turkish teachers, Singaporean teachers expressed more positive opinions about their schools on teachers' expectations for student success, parents' participation in school activities, parental support for the teaching process, students' desire to be successful, and students' ability to achieve academic goals. On the other hand, Turkish teachers had more positive opinions about their school than Singaporean teachers regarding teachers' ability to inspire students and

cooperation among teachers to plan teaching. The scores of Singaporean and Turkish teachers from the questionnaire items are presented visually in Figure 1.

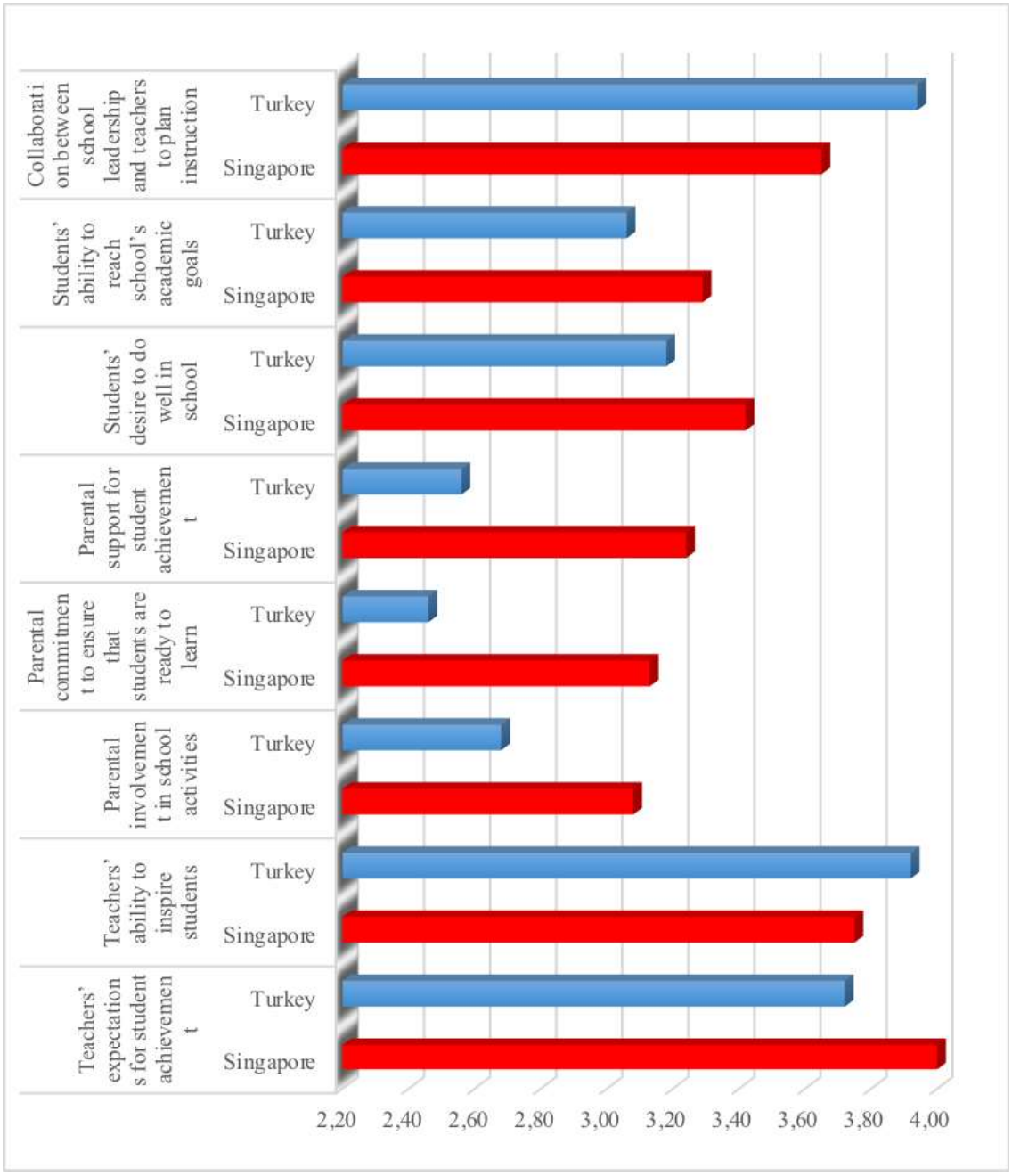

Figure 1. Scores of Singapore and Turkish Teachers from School Emphasis on Academic Success Questionnaire

Conclusion and Recommendations

This research aims to compare the answers given by Turkish and Singaporean mathematics teachers to questions

about school success. This research was conducted by the causal comparison design. The research study group consists of Turkish and Singaporean eighth-grade mathematics teachers participating in the 2019 TIMSS. As a data collection tool, questionnaires were directed to teachers under the title "School Emphasis on Academic Success" in 2019 TIMSS. TIMSS 2019 User Guide was taken into account in the analysis of the data. Independent groups t-test was used to compare the mean scores of the teachers from the questionnaire items. A significant difference was found between the average scores of Singaporean and Turkish teachers from some survey questions.

According to the results, Singaporean teachers expressed more positive opinions about their school than Turkish teachers on teachers' expectations for student success, parents' participation in school activities, parental support for the teaching process, students' desire to be successful, and student's ability to achieve academic goals. On the other hand, Turkish teachers had more positive opinions about their school than Singaporean teachers regarding teachers' ability to inspire students and cooperation among teachers to plan to teach. This difference shows that the Singaporean education system, compared to other countries education systems, has an educational approach that gives importance to student success and the necessary elements to achieve success. This means that Singaporean teachers do more to increase the success of their students, and parents are actively involved in this process. On the other hand, Turkish teachers' more positive opinions on inspiring students and cooperation among teachers indicate that the Turkish education system puts more effort into these issues and tries to motivate students more.

The results obtained in the study showed that the Singaporean and Turkish education systems have different priorities and emphases. Both education systems have strengths and have things to learn from the other. Therefore, learning from each other and sharing best practices can help all students learn better and succeed. In the literature, some studies deal with the Turkish education system, teacher education system, and student achievement with comparative approaches based on international exams (Özerbaş & Safi, 2022a; Özerbaş & Safi, 2022b; Uzun, Tümer & Yiğit, 2010). International exams offer a wide variety of rich data sources. More comparative studies are needed to understand better the possible reasons for the differences between countries' international test scores and to improve the Turkish education system.

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