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Factors and Parameters Influencing Student Achievement in Mathematics: A Comparative Study between Israel and Finland

Shirly Ester Cohen*
University of Babeş-Bolyai, ROMANIA

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Abstract: In all years of the Program for International Student Assessment (PISA) in primary mathematics education, Finland ranked in the lower places (44-61) in the dispersion index (the difference in scores between the 95th percentile and the 5th percentile), while Israel ranked in the upper places (1-3) in the same index. In the last PISA test, Israel ranked first (among the 78 participating countries) in grade differences, while Finland ranked 61st. The score for dispersion in Israel is 356 points, the highest among the countries and economic entities of the Organization for Economic Cooperation and Development (OECD). Based on these results, this comparative study between Israel and Finland was conducted to investigate the most important sociological factor in the Pisa test that influences most student achievements in mathematics in Finland and Israel, as well as the reasons for the differences in achievement between mathematics scores. The results of this study show that the differences in achievement in Israel are due to students' socio-economic status and the sector. In contrast, Finland's first sociological factor influencing student performance is socio-economic status. Nevertheless, it has a more negligible influence than in Israel. The second factor is student motivation.

Keywords: *Education, mathematics achievements, mathematics, PISA test.*

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Introduction

It is assumed that people are born equal, and ideologies point the way to social equality or equality of opportunity for people in the West and the East. However, inequality is present in all spheres of life, reflecting the outcome of social reality, where there are struggles between individuals and groups to distribute resources and rewards (Brandes, 1996).

The global education system is the primary tool for eliminating distress, reducing social gaps, and having a reformed and solidary society. Providing high-level education to all residents is a means of social equality, so the individual's achievements will be no function of national origin, community, gender, or living place. Education appears as a tool that prepares people to meet the needs of society, and it is promoted as qualified human resources training to meet best the marketplace's demands (Blass, 2020).

The Organization for Economic Co-operation and Development (OECD) education administration funded the Program for International Student Assessment (PISA) research in 2000. The PISA research was designed to enable each country to examine outputs in its education system and evaluate student achievements from an international perspective. The research was performed once every three years to 15 years old students (in most countries, they usually study in 9th-10th grades). The research examines three literacy areas: science, reading, and mathematics, and each research cycle focus on one of them. In addition to these three main areas, various "guest domains" are tested in each cycle, such as problem-solving, financial literacy, etc., to examine the extent to which students near the end of compulsory education (in most countries) have acquired general thinking tools and an understanding of the subjects tested in a way that enables them to navigate their environment effectively and efficiently, and not necessarily the extent to which they have acquired specific knowledge and content expected by one curriculum or another. The questions in this research examine knowledge in a practical approach, the knowledge essential to the "adults' world," life skills, and the ability to solve complex problems that require integration of different domains and emphasizes skills. In addition to achievements evaluation, information on various characteristics is collected about students' family and their schools. Containing these

* **Correspondence:**
Shirly Ester Cohen, University of Babeş-Bolyai, Faculty of Sociology, Cluj-Napoca, Romania. ✉ shirlyc570@gmail.com

variables may help explain the variance in academic achievements between students based on background characteristics (such as gender, socio-cultural-economic background, etc.), the learning strategies they use, and their teachers' teaching practices, as well as characteristics of school and environment. Significant effort and resources are being invested in research to obtain culturally and linguistically rich and diverse assessment tools that will allow comparison between the various and diverse educational systems in the countries participating in this research, including Finland and Israel (National Authority for Measurement and Evaluation in Education, 2016).

The Israeli education system was established with the State of Israel establishment. From 2006 to 2018, it was graded below the average in mathematics and literacy in general. For many years, there has been a crisis in Israel in mathematics studies. On the other hand, the Finish education system began operating over forty years ago to encourage economic rehabilitation programs. It was ranked at the top of the international student assessment test from 2006-to 2018, the PISA test. Figure 1 (OECD, 2019a) shows the research evidence that students in Finland are leaders in mathematics.

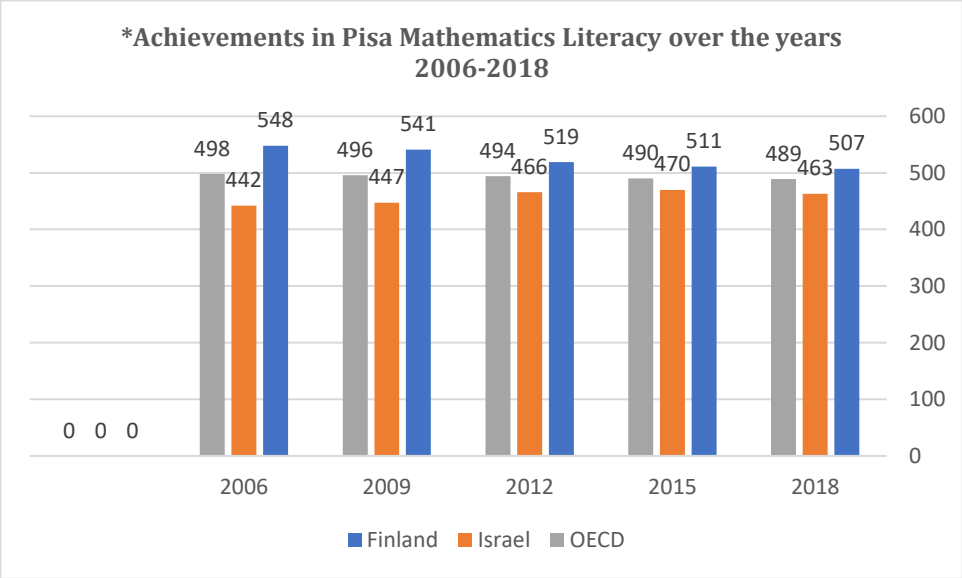

Figure 1. Achievements in Pisa Mathematics Literacy over the years 2006-2018

The research also showed that the grade distribution in Israel is among the highest in all the participating countries and the highest among OECD countries. The percentage of Israeli students who failed mathematics tests is among the highest in the OECD countries, while Finland is among the countries that have the best education system (Dattel, 2016; OECD, 2016). Finland has the lowest achievement gaps among the OECD countries because it offers a gap reduction model and promotes weakened populations, children with difficulties, and students with learning disabilities and special needs. Table 1 shows the gap between the 10th and 90th percentile (OECD, 2019a).

Table 1. The Gap Between The 10th Percentiles To 90th Percentile

	2006	2009	2012	2015	2018
Finland	208	213	220	210	213
Israel	277	271	275	269	285
OECD	234	237	238	231	235

In Table 2 (National Center for Education Statistics, 2021), it appears that the excellent Finish students (level 5-6) rate between 2006 and 2018 is 11% - 24% and higher than the OECD average, which is 11% - 13%, and comparing to Israel

Table 2. The Average Rate Of Outstanding Students Who Have Difficulty

		2006	2009	2012	2015	2018
Finland	Outstanding (Levels 5 and 6)	24.40%	22%	16%	11.7%	11.1%
	difficulty (under level 2)	5.90%	8%	12%	13.6%	14.9%
Israel	Outstanding (Levels 5 and 6)	6.10%	6%	9%	9%	8.80%
	difficulty (under level 2)	42%	39%	34%	32.1%	34.10%
OECD	Outstanding (Levels 5 and 6)	13.30%	13%	12%	10.70%	10.90%
	Difficulty (under level 2)	21.30%	36%	37%	37.40%	23.90%

The average of excellent students is below the OECD average and amounts to 6 - 8% in the same period. Table 2 data show the rate of students with difficulties. They indicate that Finland presents a much lower percentage of students with difficulties than the OECD average (the percentage of students who had difficulties in Finland between 2006 and 2018 is 6% - 15%, compared to about 21% - 24% of the OECD average). In Israel, the data is much worse. There is a much higher rate of students with difficulties, about 34% - 42%, from 2006 to 2018. It also shows that the rate of Israeli students who have failed mathematics tests was among the highest in the OECD countries. Based on these findings, the question arises as to what are the reasons for these failures and what political steps are needed to correct them.

This research examines the factors influencing student achievements on the PISA test in Israel compared to Finland. Researching the process of change in this country can provide Israeli society with methods for reducing gaps in mathematics that will help minimize heterogeneity among students in Israel, identify the classic sociological errors, and promote mathematics education from research shocks. Since answering this comprehensive question requires examination of many parameters, this research focuses on examining three main sociological factors that influence student achievement in mathematics in the State of Israel: (1) variables reflecting the home socio-economic status - cultural capital, parent education, possessions at home, socio-economic status, social-cultural status. (2) Technology related variables - technological availability at school, technological availability at home, technological resources at home (as a tablet, computer, electronic books). (3) Variables related to school - the number of mathematics study hours in school, feedback from the teacher.

Literature Review

Providing equal educational opportunities has become a central goal for policymakers worldwide. The new demands of the knowledge economy, the labor market, and the rapidly changing global world have identified educational goals as growth drivers worldwide. The development of international tests (such as the PISA test) has been built in a joint global effort by experts from participating countries and under the supervision of governments to compare student achievement in the world and learn the social, economic, and cultural impacts on education quality in education within and between countries (Pinto, 2020).

Studies show that socio-economic background data, such as parents' education, economic status, student cultural capital, etc., influence academic achievement and provide explanations for some of the causes of educational inequality in the world (Ayalon et al., 2019; Broer et al., 2019; Muelle, 2019) The results of the Pisa test confirm this assertion: it was found that there is a difference of about 400 points on the Pisa scale for students coming from low socio-economic backgrounds (OECD, 2010, 2019a). The sociological factors that affect the quality of educational systems in the world can be divided into two areas: Factors related to students' homes and factors related to students' schools.

Factors related to student's home

The factors related to a student's home include social and cultural status- it is based on the content and knowledge world that owning it confers social superiority and allegedly belonging to social classes that enjoy legitimacy and even dominance and benefits in the entire social structure or part of it. Cultural capital, unlike economic capital, mostly cannot be directly transferred to others (to be inherited), and its transfer from generation to generation involves the re-acquisition of knowledge, proficiency, and skill (Regev, 2011).

Parent education: Many research indicates that student achievements are highly affected by their parents' education level (Davis-Kean et al., 2021; Reddy & Singh, 2021). It was found that the higher percentage of academic parents in the class, the higher the student achievements (Ben Naim & Belinsky, 2012). This influence may result from the genetic ability children inherit from their parents and the home environment they grow up in and are educated in. It was found that the higher the educated family rate in class, the greater the learning atmosphere. Research that used a perennial British database examined the correlation between young people ages 16-23 and their parents' education. A significant correlation was found between each parent's education and the child's education, but it was also found that the mother's education had a stronger correlation than the father's education (Ermisch & Francesconi, 2000).

Economic status. The relative position of a family or individual in a social society system in which people are ranked according to their approach or control over their wealth, power, and status (Avvisati, 2020). This factor is one of the most commonly analyzed family background characteristics of the student's family. Sirin (2005), in his meta-analysis of 74 studies on the most influential factors for achievement, finds that socio-economic status represents one of the strongest correlations in the group. His findings show that students with higher socio-economic status typically obtain high test scores and are more likely to complete secondary school and go on to university than their counterparts of more humble origins. Research shows that even if achievement exists in the school, it is unavoidably influenced by class belonging factors. A poor child with a rich child is a competition in unequal conditions (Blass, 2020; Otero et al., 2021). The findings of the Pisa test for 2018 confirm this claim and present similar results **(**OECD, 2019b).

Minority population. Gender inequality is a significant challenge for many countries. The findings show that group inequality in academic achievement is often the result of socio-economic reality, cultural and environmental conditions, and a unique background (Blass, 2020). In addition, it was found that first-generation immigrant students are at a

significantly greater risk of being low performers (Organization for Economic Co-operation and Development, 2010). The literature presents four main explanations for the gaps between the majority and minority populations: socio-economic background, language and information gaps, ethnic segregation, and discrimination and exclusion (Shdema, 2014; Triventi et al., 2021).

Gender: Researchers have found that boys' achievements are better than girls' achievements in mathematics (Else-Quest et al., 2010; Zhao et al., 2021). The hypothesis that biological factors, including differences in brain structure and development, in genetic, neurological, and hormonal sources, explains the gap between boys and girls going to science, technology, engineering, and mathematics studies (STEM) was rejected by many researchers around the world. In its place, it was found that restrictive beliefs deeply rooted in restrictive messages about girls' and boys' roles in the world and the community are the factor that explains the gap. The social influence mediates girls through school and home and indirectly influences their academic achievements in these subjects (Sasson, 2017; Zorman et al., 2021).

Factors Related to Student's School

The results of the recent Pisa study show that educational equity is better when schools inform parents about their child's progress, modify curriculum according to student assignment results, develop new initiatives to support students, seek student feedback, and hold regular school improvement consultations at least every six months based on district or national guidelines (OECD, 2019b). In addition, another study conducted was based on the achievements analysis of the best educational systems in the world, as defined by the PISA program that was performed in twenty-five educational systems in the world, including the top ten findings shows unequivocally that the most effective educational influence factor is the teachers: good teachers. The report found three main factors mutual to the best education systems in the world: 1) attracting suitable people to teach, 2) developing teachers to be effective teachers, and 3) guaranteeing that the system provides the highest education quality possible for all the students (Barber & Mourshed, 2007; Olson, 2000).

Additional research examined and found that two students with similar abilities may develop a gap of about 50% in their knowledge and achievements within only three years if one has a good teacher and the other does not. It was also found that the success/failure of students from weak backgrounds also depends on the teacher's knowledge and proficiency (Sanders & Rivers, 1996). Research that considers all available data on teacher effectiveness shows that students who learn with excellent teachers progress three times faster than students who learn with poor teachers. The adverse effects of poor teachers are especially harsh in the early years of schooling, and students who study with poor teachers for several years in elementary school suffer irreversible educational deficits (Rivkin et al., 2005).

Another factor that may influence educational inequality is technology in schools and at home. As reliance on computer accessories and digital and mobile devices increases, so does the pressure on schools and education systems to install, implement, and integrate information and communication technologies. The learning process combined with technology is well established in various digital literacies, including multi-channel information processing literacy, cyberspace navigation literacy, communication literacy, visual literacy, hyper-literacy, personal information management literacy, and complexity literacy. This literature is part of the toolbox of the teacher and students, and their use may promote significant learning (Van Laar et al., 2020). It was found that five critical dimensions may lead to digital Inequality: Inequality in using end means, inequality in autonomic use, Inequality in required skills for using digital means, Inequality in social support, and differences in using technology (DiMaggio & Hargittai, 2001). Studies have found that the gap in students' academic achievement increased during the corona period. The reasons for these gaps were due to the shortcomings found in schools in the technological means as well as the background factors of the student. It was discovered that families with low socio-economic positions have more significant technology gaps than families with better socio-economic status (Zorman, et al. 2021).

In conclusion, international tests such as the Pisa test allow us to compare and within countries and learn about the world's different education systems and cultures. In addition, these tests make it possible to create international standards necessary in today's global reality. On the other hand, there are arguments for the weaknesses of the Pisa test. It does not explain the cultural differences among participating countries. It leads countries that adapt their national program to international standards to over-prepare, enslave, and focus on grades rather than the learning process and pedagogical values (Pinto, 2020).

Methodology

Research Purposes

This research aimed to find the most influential sociologic factors on student achievements in the PISA test both in Israel and Finland and the reasons for achievement gaps between mathematics grades in Israel and Finland.

Study Design

A comparison was performed using a statistical analysis of background questionnaires presented to the students (in Israel and Finland) and their achievements in mathematics in PISA tests in 2015 and 2018. This research examined about 6,501 Israeli students, about 5,812 Finnish students from the 2015 class, about 6,456 Israeli students, and about 5,557

Finnish students from the 2018 class (a total of 24,326 students). Only the identical questions on both dates (2015 and 2018) were selected from the background questionnaires to compare. The parameters that were chosen to be examined were divided into three main categories: (1) variables reflecting the home socio-economic status - cultural capital, parent education, possessions at home, socio-economic status, social-cultural status. (2) Technology related variables - technological availability at school, technological availability at home, technological resources at home (as a tablet, computer, electronic books). (3) Variables related to school - the number of mathematics study hours in school, feedback from the teacher.

Sample and Data Collection

The statistical analysis included a descriptive statistic of the research indices – where a variance analysis was performed to understand the correlation between the variables and whether there are significant differences, and inferential statistics that were achieved through linear regression analysis in which the selected dependent variable was mathematics grades, and the selected independent variables were all sociological variables chosen from the background questionnaires (variables reflecting the home socio-economic status, Technology related variables, variables related to school), and it was assumed that would influence the dependent variable – mathematics grades.

Results

ANOVA: Two-way Analysis of Variance

Table 3 presents the main effects between the countries and the research variables.

Table 3. Significant Main Effect of Country on Variables

Independent Variables	Israel		Finland		F
	Std. Deviation	Mean	Std. Deviation	Mean	
1. Math	98.2	468.3	75.7	509.7	1346.155**
2. CULPOS: Cultural possessions at home (WLE)	0.98	0.0270	1.04	0.168	220.374**
3. HOMEPOS: Home possessions (WLE)	1.14	0.182	0.730	0.153	5.489*
4. HISCED: Highest Education of parents (ISCED)	1.25	5.05	1.02	5.34	382.517**
5. HEDRES: Home educational resources (WLE)	0.985	0.102	0.893	0.313	1170.144**
6. FERFEED: Perceived feedback (WLE)	1.08	0.0902	0.927	0.219	88.917**
7. ICTHOME: ICT available at home	2.33	8.31	1.74	8.48	35.513**
8. ICTSCH: ICT available at school	2.69	5.74	2.07	7.04	1545.522**
9. MMIMS: Learning time (minutes per week) - <Mathematics>	95.2	244.2	47.3	171.9	5010.833**

*p<0.05, **p<0.01

A significant influence of the country on research variables was also found: (1) Students' grades in mathematics – in Finland, and student grades are significantly higher than student grades in Israel. (2) The cultural capital at student home - in Finland, the cultural capital is significantly higher than in Israel. (3) Possessions at student homes - in Finland, the possessions at student homes are significantly lower than those at student homes in Israel. (4) Parent education is significantly higher in Finland than in Israel. (5) Educational resources at student home – there are significantly more resources at student homes in Finland than in Israel. (6) Teacher feedback – in Finland, students get significantly more feedback from their teachers than in Israel. (7) Technological resources at student home - there are significantly more technological resources at student homes in Finland than in Israel. (8) Technological resources in school - there are significantly more technological resources in schools in Finland than in Israel. (9) Time of learning mathematics – the time of learning mathematics in Finland is significantly lower than in Israel.

Analysis of Regression Findings

Four regression analyses were performed in this research:

1. The Regression model predicts factors affecting graduates in Finland in 2015.
2. The Regression model predicts factors affecting graduates in Finland in 2018.
3. The Regression model predicts factors affecting graduates in Israel in 2015.
4. The regression model predicts the factors affecting graduates in Israel in 2018.

The four analyses findings were summarized in tables 4, 5, and 6:

Table 4. Explained Variance Test

Model	Finland		Israel	
	2015 Adjusted R Square	**2018 Adjusted R Square**	**2015 Adjusted R Square**	**2018 Adjusted R Square**
1	0.142	0.148	0.319	**0.301**
2	0.147	0.152	0.343	**0.324**
3	0.165	0.152	0.354	**0.334**

The table is divided into three models that have the following structure:

1. Model 1 includes all variables reflecting the home socio-economic status (cultural capital, parent education, property at home, **s**ocio-economic status, social-cultural status).
2. Model 2 includes all variables reflecting the home socio-economic status +Technology related variables (technological availability at school, technological availability at home, technological resources at home).
3. Model 3 includes all variables reflecting the home socio-economic status, +Technology related variables+ Variables related to school (the number of mathematics study hours in school, feedback from the teacher).

The findings in Table 4 indicate that in Finland, the variables in model 3 that reflect the home socio-economic status, +Technology related variables+ Variables related to school influence student achievements in mathematics by about 15.2%- 16.5%. In Israel**:** The variables in model 3 that reflect the home socio-economic status +Technology related variables+ Variables related to school influence student achievements in mathematics about 33.4%- 35.4%. The findings of Table 5 will summarize the results of the regression model that predicts the factors influencing the grads in Finland in 2015 and 2018.

Table 5. Finland- Summary Results Model

2015		**2018**	
Model	**Standardized Coefficient B**	**Model**	**Standardized Coefficients B**
(Constant)		(Constant)	
Index of economic, social and cultural status	0.330**	Index of economic, social and cultural status	0.367**
Cultural possessions at home (WLE)	0.142**	Cultural possessions at home (WLE)	0.150**
Perceived feedback (WLE)	-0.133**	Highest Education of parents (ISCED)	-0.057*
ICT available at home	-0.068**	Home possessions (WLE)	-0.047*
Home possessions (WLE)	-0.048**	ICT available at home	-0.046*
Learning time (minutes per week) - <Mathematics>	0.042*	ICT available at school	-0.042*
		Perceived feedback (WLE)	0.026*

*p<0.05, **p<0.01

The finding indicates the ranking of the sociological factor that influences student achievements in Finland (highest to lowest) in the following order: the first sociological factor is the student's socio-economic status; the second factor is cultural capital at home, and then the parameter list changes between 2015 and 2018. Interestingly, the two sociological factors that most influence student mathematics achievements are situations reflecting his family status rather than external factors such as school or technology.

Table 6 will summarize the results of the regression model that predicts the factors influencing the grads in Israel in 2015 and 2018.

Table 6. Israel- Results Model 3- Summary

2015		2018	
Model	**Standardized Coefficients B**	**Model**	**Standardized Coefficients B**
(Constant)		(Constant)	
student language	-0.393**	student language	-0.361**
Index of economic, social and cultural status	0.228**	Index of economic, social and cultural status	0.334**
ICT available at school	-0.134**	Home possessions (WLE)	-0.154**
Cultural possessions at home (WLE)	0.112**	ICT available at home	0.118**
Learning time (minutes per week) - <Mathematics>	0.093**	ICT available at school	-0.107**
Home possessions (WLE)	-0.087**	Home educational resources (WLE)	0.096**
Highest Education of parents (ISCED)	0.068**	Perceived feedback (WLE)	-0.072**
Home educational resources (WLE)	0.065**	Learning time (minutes per week) - <Mathematics>	0.064**
ICT available at home	0.049**	Cultural possessions at home (WLE)	0.042*
Perceived feedback (WLE)	-0.045**		

* p<0.05, **p<0.01

The finding indicates the ranking of the sociological factor that influences student achievements in Finland (highest to lowest) in the following order: the first sociological factor is the students' language, namely the sector from which the students come. The second most influencing factor on student achievements is the student socio-economic status, and then the parameter list changed between 2015 and 2018. Here too, the two sociological factors that are the most influencing student achievements in mathematics are due to situations reflecting his origin and his family status rather than external factors such as school or technology.

To expand the thinking, we decided to add another parameter – student motivation. Since the comparison between the 2015 and 2018 dates was between similar questions taken from the background questionnaire, and since there were no overlapping questions between the two dates, the regression model between Israel and Finland was examined only in 2018.

The parameter – student motivation that was examined- referred to the student's desire to succeed at school. Analyzing the findings in Table 7, we may see that there is no significant change in the explained variance when adding the motivation parameter to the regression equation:

Table7 . Summary of Models Results- Finland/ Israel, 2018 That Includes the Motivation Variable

	Finland		Israel	
Models	**Without motivation Adjusted R Square**	**With motivation Adjusted R Square**	**Without motivation Adjusted R Square**	**With motivation Adjusted R Square**
1	0.148	0.166	0.298	**0.301**
2	0.152	0.170	0.323	**0.324**
3	0.152	0.171	0.332	**0.334**

In Finland**:** The findings in Table 7 indicate that the influence of all variables with or within motivation has almost the same effect. The gap is a maximum of 1.9%. In Israel, the findings indicate that the influence of all variables with motivation or within motivation has almost the same effect. The gap is a maximum of 0.3%.

Looking at Table 8 with the regression model, we may see that the motivation parameter is a significant factor influencing all student mathematics achievements in Finland.

Table 8. Analysis Only on 2018 That Includes the Motivation Variable

Finland		**Israel**	
Model	**Standardized Coefficients B**	**Model**	**Standardized Coefficients B**
(Constant)		(Constant)	
Index of economic, social and cultural status	0.351**	Student language	0.368**
Motivation for studies	0.146**	Index of economic, social and cultural status	0.337**
Cultural possessions at home (WLE)	0.140**	Home possessions (WLE)	0.153**
Highest Education of parents (ISCED)	0.059*	ICT available at home	0.116**
ICT available at home	0.045*	ICT available at school	0.106**
ICT available at school	0.042*	Home educational resources (WLE)	0.089**
Perceived feedback (WLE)	0.027*	Perceived feedback (WLE)	0.078**
		Learning time (minutes per week) - <Mathematics>	0.062**
		Motivation for studies	0.047**
		Cultural possessions at home (WLE)	0.041*
		Highest Education of parents (ISCED)	0.035*

These table findings indicated that the sociological factor that is the most influential on student achievements in mathematics in Israel is the same as in Table 6: the sector and the socio-economic status of each student. Still, the first sociological factor influencing student achievements in Finland is the same as in Table 5: the student socio-economic status. However, the second most influencing factor on student achievements is different, and it is student motivation. This change provides deeper observation of student achievements and indicates that one state stems from the student's family status, while the second stems from the student's desire to succeed. It is interesting to see that in Israel, this datum has only a minimal place (9 out of 11). For a deeper understanding, a t-test was performed between index of economic, social and cultural status (ESCE) and the sector was examined and presented in Table 9:

Table 9. t-Test – Finland Independent Variable- Escs, Dependent Variable- Sector.

	2018				**2015**			
sector	**N**	**Std. Deviation**	**Mean of ESCS**	**t**	**N**	**Std. Deviation**	**Mean of ESCS**	**t**
1. Majority- Finnish	5179	0.788	0.274	8.246*	5469	0.750	0.241	8.042**
2. Minority - Swedes	378	0.756	0.620		343	0.669	0.543	

*p<0.05, **p<0.01

The table findings indicate significant differences between the averages between student socio-economic status and sector in two tests. The economic situation of Swedish-origin students (representing the minority in Finland) is better than the Finnish student status with a slight standard deviation. The two test dates observed an increase in the socio-economic status of both sectors. Still, the Finnish industry had a smaller increase than the Swedish sector, and the standard deviation had the same growth (the Finnish sector had a slighter increase than the Swedish sector).

Table 10. t-Test – Israel Independent Variable- Escs, Dependent Variable- Sector.

	2018				**2015**			
Sector	**N**	**Std. Deviation**	**Mean of ESCS**	**t**	**N**	**Std. Deviation**	**Mean of ESCS**	**t**
1. Majority- Jews	4868	0.872	0.520	23.665**	4842	0.792	0.266	13.769**
2. Minority - Arabs	1588	1.07	0.183		1659	0.945	0.0893	

*p<0.05, **p<0.01

The situation in Israel is the opposite – in the two-test date, a significant *d*ifference between the averages was found between the student socio-economic status and the sector. It was found that the socio-economic status of Arab students

(that represent the minority in Israel) is lower than Jewish students. The two test dates observed an increase in the socio-economic status of both sectors, but the standard deviation also grew.

Discussion

This research engaged with the sociological factors influencing student achievements in mathematics. A comparison was made between Finland and Israel. It was found that in Finland, the grades are higher than in Israel and that all sociological data related to education in Finland (cultural capital, parents' education, technological and educational resources at home, technological resources at school, and students' feedback) are higher than in Israel in all parameters studied. Many studies confirm this claim and indicate that there is a relationship between the student's background data and their achievements (Ayalon et al., 2019; Broer et al., 2019; Davis-Kean et al., 2021; Muelle, 2019; OECD, 2010, 2019a; Reddy & Singh, 2021). In addition, it was found that the possession at student home and the time of studying mathematics in Finland are lower than in Israel. Previous research findings can explain these results by the claim that the number of teaching hours does not affect student achievement (Barber & Mourshed, 2007).

The study results indicate that the first sociological factor influencing student achievement in Israel is the language of the students, i.e., the sector from which the students come, and in Finland, the student's socio-economic status. The second most influencing factor on student achievements is the student socio-economic status in Israel, while it is the student motivation in Finland.

This change provides deeper observation of student achievements and indicates that one state stems from the student's family status, while the second stems from the student's desire to succeed. It is interesting to note that in Israel, this datum has only a minimal place (9 out of 11).

The differences in Israel result from the students' socio-economic status and industry, while socio-economic status is the first factor affecting student achievements in Finland. Still, it has less influence than in Israel .The research findings indicated that possession at student homes in Finland is lower than in Israel, perhaps because the school in Finland neutralizes the classes of possession in students at home, which does not affect their learning performance. In contrast, the class difference is the main factor in acquiring education in Israel.

The combination of low achievements and high inequality has characterized the Israeli education system for a long time (Ayalon et al., 2019; Ben-David, 2014). The PISA test results indicate that the Israeli education system presents two education systems: the Arab education system and the Jewish education system, and they are not equal (Gruber, 2017).

The data in Table 11 show clear findings that confirm these research findings: it may be seen in the two sectors that the higher the socio-economic background, the higher the excellence rate, and the rate of those who have difficulties is lower and vice versa. There is a clear and absolute trend of gaps between the Arab sector and the Jewish sector in all the research years. This table shows that through all the research years, the excellence percentage (levels 5+6) in the Arab sector, within the division of socio-economic background sections, is only between 0% and 2% compared to the Jewish sector, where the excellence percentage is between 2% and 21%. In the Arab sector, only 1%-2% of the students in high socio-economic level excel compared to 13%-21% of Jewish students in high socio-economic status. Looking at the percentage of weak students who have difficulties (below level 2), we will find data indicating significant gaps between the sectors. In the Jewish sector, the percentage of students who have difficulties in the division to socio-economic background sections is between 11% and 53%, compared to those who have difficulties between 52% and 75%. The 2015 PISA report (National Authority for Measurement and Evaluation in Education, 2015) presented comprehensive findings on the two sectors. Only 1% of all examinees in the Arab sector reached excellence levels (5-6 level) compared to 12% of all Jewish sector examinees. A huge gap of about 104 points was also found between Jewish and Arab society, and the rate of students with difficulties (below level 2) this year was 22% of all examinees in the Jewish sector compared to 64% in the Arab sector.

Table 11. Pisa 2006- 2015: Sectoral Comparison -Comparison Based on Socio-Cultural-Economic Background

	2006			2009			2012			2015		
	Lower class	**Middle class**	**High class**	**Lower class**	**Middle class**	**High class**	**Lower class**	**Middle class**	**High class**	**Lower class**	**Middle class**	**High class**
Arabs - Average	361	373	406	356	374	400	373	391	430	382	391	414
Outstanding (Levels 5 and 6)	1%	1%	2%	0%	0%	1%	0%	0%	2%	0%	1%	2%
Difficulty (below level 2)	75%	65%	57%	79%	70%	59%	73%	65%	47%	69%	63%	52%
Jews - Average	416	462	500	421	473	515	440	486	536	449	496	533
Outstanding (Levels 5 and 6)	2%	6%	13%	2%	6%	15%	3%	10%	21%	3%	11%	20%
Difficulty (below level 2)	53%	33%	20%	49%	27%	14%	41%	23%	10%	37%	21%	11%

The Israeli Ministry of Education can learn a lot from Finland, which advocates for providing equal opportunities for students. It seems that the Finnish education system is an autonomic system that succeeds in making its students similar in-school space, starting by giving the students basic needs (such as breakfast and lunch to all students in school for free and providing health and welfare services) and a sense of security. In Finland, unlike in Israel, the free education law is free: all the students receive learning materials, and enrichment is provided to all students free of charge, unlike in Israel, where all the required equipment, as well as nutrition and health and welfare services, are paid by the student parents (City of Helsinki, 2021). When a child's basic needs for learning are provided, authentic learning enables the child to be available to his future aspirations. Perhaps it is why the second most influencing factor for student success in mathematics in Finland is student motivation to fulfill his aspirations in his future profession. The findings show that the student sector was the essential factor in the Pisa test that influenced most student achievements in mathematics in Israel. It was also found that there is a significant correlation between the ESCE. A low socio-economic status student may find it difficult to adjust to the educational system and use it as a social mobility system.

Additionally, the literature review shows that a correlation between social status and lifestyle is prominent among all classes in society. Still, the medium and high classes translate their money into consumption patterns encouraging scholastic achievements and bringing the child closer to school. In contrast, the lower-class child, on the other hand, lives in conditions of overcrowding and family instability.

Conclusion

This research found that student achievement level in mathematics partially (35%) results from variables related to the students and their ability, but background variables such as parent income, origin, nationality, etc. It was also found that student motivation level grade (his academic aspirations) is among the lowest, unlike in Finland, where this index was the second index influencing student success. It should also be mentioned that while the socio-economic status of students in Finland has the most significant impact on student achievement, student achievement in Finland is much higher than in Israel, and the grade distribution is the lowest. The education system in Finland manages to help students from lower economic or social backgrounds advance in their academic achievements, maximize their academic ability and reduce achievement gaps. In addition, this research found that minority achievements in Finland (the Swedes) are higher than the majority achievements (while in Israel, it is the opposite). This important finding should be explored in the future to investigate how Finland does it. The reasons for low achievement in mathematics in Arab society in Israel should also be discussed in the context of socio-economic status.

This research shows that there has been educational success in mathematical subjects between the Arab and Jewish societies for many years, and until now, there has been no significant improvement. This research reveals the state of the Israeli educational system and reflects the reasons for the vast achievement gaps between students. Finland, considered a low-gap country, can provide an example of a model from which we can learn how to reduce gaps significantly.

Recommendation

The following recommendations emerge from this study:

- Preventing the state of many students of low socio-economic status in one school. Students of low socio-economic status may be integrated into solid schools.
- To reduce the problem of heterogeneity in classrooms, the mathematical mapping must be implemented in every school classroom. After the mapping is done, a personal work program must be prepared for each student, and the program will be taught in small groups during and outside school hours.
- The Arab population in poor local authorities should be prioritized in budgeting.
- Learning day when Arab sector students will study mathematics together with Jewish sector students should be conducted.
- In-depth research regarding the achievement gaps in mathematics in the Arab society should be promoted and examine in the Arab community the factors influencing the gaps. It is recommended to interview senior factors such as school principals, mathematics teachers, educational guides, and factors in the Ministry of Education to understand the reasons for the gaps.
- Additional research should examine how Finland reduces the gaps in classes and how it treats minorities. We may have an excellent example of applying gap reduction in mathematics achievements.
- Learning centers should be opened for weakened populations in the afternoon, financed by the state, and provide the students with classes and mathematics tutoring for free.
- Mathematics teaching cadets should be recruited as part of the teaching training to assist and reinforce school students in the Arab sector. Teaching cadets can help teachers every day at work or help in the evening in the learning centers.
- Enrichment classes should be held in school and develop mathematical thinking adapted to the 21st century.
- A "Parental Counseling Center" should be opened in weakened areas and assist parents in guiding them on how to promote their children in Israeli society.

Limitations

This study examined the sociological factors that most influence students' achievement in mathematics but did not explore in-depth the reasons for which factors.

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