

## Original Paper

# The Influence of Sociological Factors on Student Achievement in Mathematics in Israel

Shirly Ester Cohen<sup>1\*</sup>

<sup>1</sup> Department of Sociology, Babes-Bolyai University, Cluj-Napoca, Romania

\* Shirly Ester Cohen, Doctoral researcher (supervised by Prof. ValérVeres), Department of Sociology, Babes-Bolyai University, Cluj-Napoca, Romania

Received: August 1, 2021

Accepted: August 10, 2021

Online Published: August 12, 2021

doi:10.22158/wjer.v8n4p79

URL: <http://dx.doi.org/10.22158/wjer.v8n4p79>

### **Abstract**

*The education system and the higher education system are a main key to enter the occupational system in high-tech industries in science and technology areas—the most successful field in Israel in the last few years. This field ensures much higher income than the economy average and may also lead to social mobility. In order to admit these studies, the higher education system sets preliminary threshold terms as the student's grade in mathematics matriculation test and the number of study units he studied. As a result, these two systems create a pyramid that as we go higher on it, the learner rate declines. In international perspective the State of Israel was ranked in the lowest places in quantitative literacy achievements in the years 2006-2018. In addition, Israel is one of the countries with the largest disparities among the OECD countries during all research years. This article will present findings from research literature that provide a general overview of student achievements in mathematics in Israel and in addition we will discuss the influence level of sociological factors on student achievement in mathematics.*

### **Keywords**

*education, mathematics achievements, occupation, poverty, social disparities, social mobility, PISA, matriculation tests.*

### **1. Introduction**

The high-tech industries rely on quality manpower in science and technology fields and are the example to the Israeli market growth and prosperity in the last years. This industry serves both the national and private interests. On one hand, the state enjoys the strengthening of its economical resilience and on the other hand, the individual integrated in this industry has high income comparing to the average salary.

The data indicate that the Israeli high-tech export in 2019 peaked at about 45.8 billion USD, which is about 46% of total export in Israel. The respective employee rate in high-tech was 9.2% (Lwin & Keren Zur, 2020). Currently, an average salary in high-tech companies is about 31,525 NIS compared to the national average salary of only 12,740 NIS (Gad, 2021).

The large economic gaps in Israeli society are presented along with these findings. The 2020 poverty report findings presents the poverty rate data of 20.8%, compared to 21.7% in 2019 and 21.4% in 2018. The percentage of children under the poverty line was 30% in 2020, compared to 30.9% in 2019 and 30.7% in 2018 (Endeweld et al., 2021). The calculated poverty dimension in Israel in international perspective, through the OECD in a quite similar method to the National Insurance calculation, found that Israel was placed in 2017 at the **top** of developed countries in poverty rates and in **second place** in poverty rate among children (the National Insurance Institute, 2018). It was also found that about 37.6% of the population are in low status or medium-low status and about 53.4% of the population are middle class (Endeweld et al., 018).

Due to occupation structure in modern society, which some call “specialists society”, education is perceived as a very important means to social mobility, and the expertise level required for many professions increases every year. School in general and matriculation in particular provide the student starting point in acceptance to academic studies that may lead him to achieve society expectations, entering the proper occupational system and to social mobility. It was found that many academic professions that are studied in universities and colleges (as the high-tech professions), which may lead to high income for the graduator, require threshold terms in mathematics grade in 4 or 5 study units level in matriculation diploma.

### *1.1 Matriculation Diploma as Acceptance Term for Academic Studies*

The matriculation diploma is a diploma granted to high school gradutors who have successfully met all scholastic and legal requirements of the Ministry of Education in Israel and is an evaluating index for graduate suitability to undergraduate studies and a necessary condition for admission to academic studies. the diploma includes the obligatory subjects (which are also called core subjects and detailed in table No. 1) defined in study units (between 1 to 5 study units) that represent the deepening level in the studied subject, the exam difficulty level and the number of learning hours. The students take an external test (according to the study unit) and will be eligible for a matriculation diploma if they have a minimum of 21 obligatory study units (see Table 1) and met school’s requirements that include participating 180 hours of sport classes (60 hours in 3 years), participation in social involvement (volunteering activity in the community for 180 hours (60 hours in 3 years), taking a test in physics or biology or chemistry or science and technology in a scope of 3 weekly hours for one year and participating a 30 hours class of social sciences and humanities, culture and heritage, science and technology, languages and arts—cross-cultures subjects that expose the participants to wide world of emotions and creativity (the examination department, 2021)

**Table 1. Obligatory Subjects in Matriculation Exams**

State education	Religious education	state education	Independent education (Ultra-Orthodox)	Arab education	Druze education
Mathematics—3 study units at least					
English-3 study units at least					
History-3 study units at least					
Citizenship-3 study units at least					
Bible-2 s.u.	Bible-3 study units			----	----
Literature-2 s.u	Literature and Judaism studies-2 s.u	and	Literature-2 s.u	Arabic-3 study units	
Hebrew-2 study units				Hebrew-2 study units	
	Talmud and oral Bible-3 s.u.		Judaism-3 s.u. or oral Bible or Talmud History-2 s.u.	Islamic culture and heritage or Christian culture and heritage-1 s.u.	Druze culture and heritage-1 s.u.
Testing on at least one extended subject (up to maximum 3) in 5 study units' level (not including mathematics/ English)					

The admission process in universities requires a weighted grade of matriculation exams and psychometric test grade (an additional external test uses as additional index to rank academy candidates). Many professions including high-tech, medicine, business administration, economy, engineering professions, science, architecture, computer sciences etc., require matriculation diploma with 4 or 5 s.u. in mathematics. Not meeting these terms will not allow the graduator to be accepted to academic studies in these fields. The Ministry of Education data show that the percentage of students eligible to matriculation diploma in 2014-2019 (when 2019 is the most updated datum) is between 65.5% to 69.7% -see table No. 2 (national education image, 2021).

**Table 2. Perennial Data of Eligibility Percentage of Matriculation Diploma/Matriculation Diploma with Mathematics in 3/4/5 s.t. Level (Note 1)**

	2014	2015	2016	2017	2018	2019
Percentage of students eligible to matriculation diploma from all learners	65.5%	66.1%	66.2%	68.2%	69.9%	69.7%

Percentage of students eligible to matriculation diploma with 4 s.u. level in mathematics from all learners	16.8%	17.6%	17.5%	17.0%	17.6%	18.5%
Percentage of students eligible to matriculation diploma with 5 s.u. level in mathematics from all learners	9.5%	10.4%	11.4%	14.5%	15.5%	15.5%

Derived from the table

Percentage of students eligible to matriculation diploma with 3 s.u. level in mathematics from all learners	39.2%	38.1%	37.3%	36.7%	36.8%	35.7%
Not eligible to matriculation diploma	35%	34%	34%	32%	30%	30%
Percentage of students from all learners that will be able to be accepted to academic studies with mathematics level of 4 or 5 s.u.	74%	72%	71%	69%	67%	66%

This datum indicates that in Israel about 30%-35% cannot be accepted to academic studies at all, it was also found that the percentage of students eligible to matriculation diploma with 4 or 5 study units' level in mathematics from all learners is 26%-34% (see Table 2), namely it may be said that 35.7% -39.2% of the students eligible for matriculation diploma study in 3 study units level (the lowest level) and cannot be accepted to the "desirable" professions. Deepening in the data we may conclude in general observation that most of the population (66%-74%) cannot be accepted to "desirable" profession studies or to academic studies at all, a fact that will influence the learner's future income and life quality.

The Central Bureau of Statistics published in 2020 findings of high school gradulators follow up to 8 years after graduation. The last class published was of 2010 gradulators. The research findings indicate that 82.3% of the students, who have studied in the 12th grade in 2010, studied in matriculation course, while only 48.3% of these students have graduated this course successfully. Among those who are eligible for a diploma, some of the gradulators did not meet the higher education institutes threshold requirements, therefore the eligible rate who could apply to higher education was 41.4% of the age group. The findings indicate that until 2018, only 1 of 3 (32.7%) of the 17 years old group in 2010 arrived at one of the higher education institutes in Israel (Lieberman, Swirski, & Konor-Attias, 2020).

### 1.2 International Perspective—Israel in Comparison to the World in Mathematics Achievements

In international perspective it was found that the State of Israel was ranked 39-41 in mathematics out of 72 places and that the grade distribution in Israel in mathematics (an in all other fields) is one of the largest among the countries and economical entities participating and the largest among the OECD countries in the research years-see table No. 3 (NCES, 2021).

**Table 3. The Average Rate of Outstanding Students Who Have Difficulty**

		2006	2009	2012	2015	2018
Israel	Rate/number of countries	40	41	40	39	40
	Outstanding (Levels 5 and 6)	%6.10	%6	%9	%9	%8.80
	difficulty (below level 2)	%42	%39	%34	%32.1	%34.10
OECD	Outstanding (Levels 5 and 6)	%13.30	%13	%12	%10.70	%10.90
	difficulty (below level 2)	%21.30	%36	%37	%37.40	%23.90

The research findings indicate that in the years 2006-2018 the rate of students having difficulties in mathematics is higher than the OECD average and about one third (and even more) of Israeli students have difficulties in this subject. In addition, it was found that the rate of excelling student in Israel is low in these years from the OECD average and is about 7.5% average compared to about 12% the international average.

It is important to note that the PISA research goal is to predict the student's readiness level to cope with his adult life, examine if the student does not to translate what he had studied in the education level (or outside it) to activity in various fields, and examine if the tools and skills he has allows him to cope with what life will bring to him. These findings indicate that Israeli students do not have sufficient skills in mathematics to integrate in society and occupation in the future in accordance with the admission data for academic studies, the future employment situation and earning ability (RAMA, 2019).

### 1.3 The Research Execution

Quality education is necessary and helps to build a strong and healthy society. The low achievements of Israeli students in mathematics and the large gaps indicate failures in the education system. The asked questions due to these findings are what the reasons for these failures are and what are the required policy steps to correct it. In order to answer these questions, I will examine in this part the factors influencing student achievements in mathematics using PISA tests in the years 2015 and 2018. These dates (the latest dates performed so far) were selected in order to examine if there is consistency between dates in the factors affecting student achievements in mathematics that will give a comprehensive image of the status in Israel.

## 2. Method

This research compared the background questionnaires presented to students and their mathematics grades in PISA test in 2015 and 2018. About 6501 students from the class of 2015 and about 6456 students from the 2018 class (total of 12,957 students) were examined within this research. The question selected were the overlapping questions that were included in both dates.

the research used the ANOVA explained variance test (see table 5) by building a model that were divided to three main categories (see table 4):

- **variables reflecting the home socio-economic status**—cultural capital, parent education, property at home, socio-economic status, social-cultural status.
- **Technology related variables**—technological availability at school, technological availability at home, technological resources at home (as tablet, computer, electronic books)
- **Variables related to school**—the number of mathematics study hours in school, feedback from the teacher

## 3. Result

**Table 3. Model**

Variables Entered/Removed <sup>a,b</sup>			
Method	Variables Removed	Variables Entered	Model
Enter		Cultural possessions at home (WLE), Highest Education of parents (ISCED), Home possessions (WLE), Index of economic, social and cultural status <sup>c</sup>	1
Enter		ICT available at school, ICT available at home, home educational resources (WLE) <sup>c</sup>	2
Enter		Learning time (minutes per week) - <Mathematics>, Perceived feedback (WLE) <sup>c</sup>	3

a. Year, Country Identifier

b. Dependent Variable: math

c. All requested variables entered.

**Table 5. Explained Variance Test**

	Std. Error of the Estimate	Adjusted R Square	R Square	R
2015	84.51089	0.165	0.166	.407 <sup>b</sup>
	80.51710	0.242	0.243	.493 <sup>c</sup>
	78.53635	0.279	0.280	.529 <sup>d</sup>

2018	81.09515	0.191	0.192	.438 <sup>b</sup>
	79.31480	0.226	0.227	.477 <sup>c</sup>
	78.46694	0.243	0.244	.494 <sup>d</sup>

- The findings in Table 5 indicate that the demographic variables including cultural capital, parent education, property at home, socio-economic status and social-cultural status influence student achievements in 16.6%-19.2%. The technology related variables influence student grades in 3.5%-7.7% and the school related variables influence student achievements in 1.7%-3.7%. namely the student demographic variables have the main influence.

In order to understand better which of the social / cultural factors is the most influencing factor, each factor was examined using hierarchical regression. the results are presented in table No. 6:

**Table 6. Hierarchical Linear Regression**

2015			2018		
Sig.	Standardized Coefficients Beta		Sig.	Standardized Coefficients Beta	
0	0.407	Index of economic, social and cultural status	0	0.514	Index of economic, social and cultural status
0	-0.179	Home possessions (WLE)	0	-0.146	Home possessions (WLE)
0	0.097	Highest Education of parents (ISCED)	0	0.085	Cultural possessions at home (WLE)
0.002	0.055	Cultural possessions at home (WLE)	0.174	-0.034	Highest Education of parents (ISCED)
0		(Constant)	0		(Constant)

The Table findings indicate that the most influencing factor among the demographic factors examined is the student socio-economic status. It seems that in both tables there is a positive correlation between the student socio-economic status and his scholastic achievements. Namely the better his socio-economic status the higher his scholastic achievements.

The second factor found significant and affecting student achievements is the property at home. In this part the participants were asked to report the availability of home items as desk, computer for learning, internet connection, car, television etc. these items were selected since they were perceived as suitable indices of family wealth in the country. The research results indicate a negative influence in both cycles,

namely the more property at home the lower the student achievements.

The social-cultural status was found significant in both dates and included questions dealing with cultural capital in the student's home and the availability of literature items (as poetry and classic literature books), art, music, design and musical instruments (like guitar and piano). This factor was found as the most influential factor in the 2015 and 2018 exams; it was ranked third.

In addition, parent education index was found significant in the 2015 research and ranked as the third influential factor on student mathematics achievements and in 2018 it was found insignificant.

#### 4. Discussion

Due to the data presented in this article, it was found that the variables reflecting the social-cultural status influence about 18% of student achievements in mathematics. It was also found that the main factor influencing student success in mathematics is his socio-economic status. Adding the technology related variables and the variable related to school we may see explained variance of 0.2652 in average, i.e., about 26.2% influence on student achievements in mathematics.

Shapiro and Ben-Eliezer (1989) claimed that a poor child's coping with a rich child is a competition in unequal conditions. While a rich child has the opportunity to be assisted by private teacher, has a separate room with his own desk and he can study in private school, the poor child lives under overcrowding conditions and family instability and even his linguistic development is poor. In addition, it seems that lower class people do not succeed in developing an aspiration to academic success. Many lower class people who aspired to academic success have failed. Many sociologists and anthropologists refer to this aspect to poverty culture running from generation to generation among lower classes. This culture encourages passivity and accepting fate, cynical attitude, unwillingness to organize, abandonment and neglect. the correlation between social status and life style is noticeable among all social strata, but the middle and high classes translate their money to consumption patterns that encourage scholastic achievements and connect the child to school: parents tend to be much more involved in child's education, interested in his achievements and anchorage him if he fails. However, in lower class, parents do not show interest in the child's status and sometimes are even hostile towards school and it teachers and it is mainly prevent the child's proper entrance to labor cycle.

Following these data, the Ministry of Education published primary recommendations aimed to weaken populations in order to reduce the gaps that include reinforcement in core subjects' studies during vacations, in the afternoon, with designated and differential budgeting for the teaching teams. forbidding schools to collect special fees for these reinforcements and recruiting teaching students to perform these reinforcements during vacations and holidays and along the year (Ministry of Education, 2020). There is no doubt that these recommendations may improve a little and promote the gap reduction, but since this issue is common for many years, maybe this issue must be better studied, and a national fundamental program may be built to treat these children.

This research examined only few parameters. Therefore, it will be expended and examine additional



parameters like sector, gender and motivation and see if it significantly changes the explained variance. I believe that examining these variables will lead to comprehensive conclusions that will help the students to achieve better achievements in the future.

## References

- Endeweld, M., Gottlieb, D., Heler, O., & Karadi, L. (2021). *Annual report 2017: Poverty dimensions and social disparities*. The National Insurance Institute, the State of Israel. Retrieved from [https://www.btl.gov.il/Publications/oni\\_report/Pages/oni2017.aspx](https://www.btl.gov.il/Publications/oni_report/Pages/oni2017.aspx)
- Endeweld, M., Heler, O., Karadi, L., & Kaliner (Kasir), N. (2021). *The Standard of Living, poverty and inequality of income*, the National Insurance Institute. *The State of Israel*. Retrieved from [https://www.btl.gov.il/Publications/oni\\_report/Documents/oni2019.pdf](https://www.btl.gov.il/Publications/oni_report/Documents/oni2019.pdf)
- Gad, L. (2021). *The average salary in March-12,740 NIS, in high-tech: 31,525 NIS*. Retrieved from <https://www.ynet.co.il/economy/article/rkFknf85u>
- Levine, H., & KertenZur, M. (2020). *Innovation status in Israel-first chapter: High-tech in Israel 2019 - growth and prosperity along with difficulties and barriers*. The innovation authority-the Ministry of Economy and Industry. Retrieved from <https://innovationisrael.org.il/magazine/4896>
- Lieberman, A., Konor-Attias, E., & Swirski, S. (2020). *Social status 2020*. Adva center-information on equality and social justice. Retrieved from <https://adva.org/wp-content/uploads/2020/02/SocialReport2020.pdf>
- National education image-2019*. (2021). *Transparency in education, the Ministry of Education-economy and budget administration, computing and information systems administration*. Retrieved from <https://shkifut.education.gov.il/national/educationPicture>
- PISA-D In-School Assessment Technical Report- Chapter 16: Scaling BQ Data. (2019). *OECD*. Retrieved from <https://www.oecd.org/pisa/pisa-for-development/pisafordevelopment2018technicalreport/>
- PROGRAM FOR INTERNATIONAL STUDENT ASSESSMENT –PISA*. (2021). *National Center for Education Statistics (NCES)*. Program for International Student Assessment (PISA) - Overview (ed.gov)
- RAMA. (2019). *“PISA 2018: sciences, reading and mathematics literacy among 15 years old students”*. The Ministry of education. Retrieved from [https://meyda.education.gov.il/files/Rama/PISA\\_2018\\_Report.pdf](https://meyda.education.gov.il/files/Rama/PISA_2018_Report.pdf)
- Shapiro, Y., & Ben-Eliezer, U. (1989). *Elements of sociology*. Tel-Aviv, Am Oved.
- The terms of having eligibility for matriculation diploma*. (2021). Exam department, the Ministry of Education-pedagogic administration. Retrieved from <https://edu.gov.il/minhalpedagogy/exams/matriculation-certificate/Pages/The-Reforma-constitution.aspx>
- Thinking group: Disparities and inequality in online learning*. (2020). The Ministry of Education –

head scientist bureau. Retrieved from  
<https://meyda.education.gov.il/files/LishcatMadaan/gapsandinequality2020.pdf>

**Note**

Note 1. The data is retrieved from: national education image, 2019, the Ministry of Education.  
<https://shkifut.education.gov.il/national/educationPicture>