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How the Sciences are Studied in Countries Around the World

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The review presents a description of the state of science studies in 14 countries, including Israel. In the list of countries are those participating in the international PISA and TIMSS tests that are characterized by gaps and migration which, in recent years, have grown on the international test measures. This review is based on information from a questionnaire sent to leading researchers from various countries that focus on the field of science education.

These countries are: Czech Republic, Estonia, Finland, Georgia, Germany, Greece, Holland, Israel, Portugal, Serbia, Slovakia, Sweden, Turkey, and the United States. On the PISA tests in mathematics, there are countries that ranked in the top 15 (Estonia, Finland, Holland and Germany), those in the third percentile (Czech Republic, United States and Portugal), in the fourth and fifth percentiles (Sweden, Slovakia, Greece, Turkey, Israel and Serbia) and in the sixth percentile (Georgia).

The survey reveals that in most countries, science studies begin at ages 6 to 7, and in middle school, the sciences are studied until ages 14 or 15, depending on how the education system divides science subjects with respect to middle and high school. In all countries, science studies are compulsory in elementary and middle school, although this requirement is not always enforced. The science subjects studied are general science, geology or geography, space science, astronomy, chemistry, biology, and physics.

In elementary school in all the countries taking part in the survey, the sciences are studied using an integrative approach. However, in most middle schools, these subjects are taught separately or in different combinations (biology with physics, biology with chemistry, etc.). In a minority of countries, the sciences are studied as an integrated subject.

In most of the countries in which science subjects are studied separately, they are taught by subject matter teachers trained in teaching one or two subjects, except in Estonia where middle school science teachers receive general training in science education but no training in a specific science subject.

In most elementary schools, two to three weekly hours are dedicated to science lessons.

Within the framework of the survey, a comparison between curricula in different countries was conducted and the insights of the researchers who were interviewed regarding science studies in their country were collected.

Insights from the analysis of results

The survey results do not point to characteristics of science education that are essentially different in the varous countries. The researchers in the different countries mentioned similar challenges in the context of science studies: teachers are older, there is a shortage of young teachers because the subject is perceived as non-prestigious. A great many of the teachers do not demonstrate professionalism because they do not have time to participate in continuing education courses for teachers; the researchers view the classes as too crowded – even in Finland; in most of the countries (except for Finland and Estonia) the researchers indicated that: there is a lack of suitable laboratories and technical equipment; there is time pressure due to an overloaded curriculum; and, emphasis is placed on content, not on skills.

In most countries, the curricula are rather similar with the exception of the subject of geography which holds a central place in all the countries surveyed except Israel.

Teachers' salaries were mentioned in just three countries as a negative factor that affects science teaching: Georgia, Estonia and Israel. This means that in most of the countries, the issue of wages does not constitute a central factor in not meeting the goals that policymakers set. In comparing teachers' salaries to the average wage in each country's economy, it was found that in most countries, teachers' salaries are even higher than the average wage in the economy. The data presented were for teachers with several years of seniority in the field.

From the survey's findings, it appears that it is insufficient to search for differences in variables such as teaching hours, curriculum, or the age at which learning science begins, but that cultural differences also have significance.

It is interesting to see the education system in Estonia, which attained remarkable achievements on all the international measures of education, most notably on the 2015 PISA tests, which ranked the country as number one in Europe. In Estonia there is school autonomy, technology is studied at advanced levels and, in the goal of ensuring they stay in the system, help is given in absorbing new teachers. This is done by pairing a senior teacher with a new teacher in every school, and by determining a teacher's wage so that it parallels the average wage in the economy starting from the very first year of employment.

These data are supported by a value system in which excellence is a leading value, and this ethos is expressed by high expectations of the students and in proactive activities within the school framework to achieve this goal.