

Brazilian Youth and Science: Possible Relationship of Interest

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The decline in interest of young people in a science career, observed in several countries, has led to a movement in favour of listening to students' opinions about their science classes, science and science careers. One of these movements is the project "The Relevance of Science Education" (ROSE), implemented in over 40 countries and the subject matter of the work described in this paper. In this sense, this article aims to verify the overall interest of young people in school science, a science career and a job that deals with advanced technology. The Brazilian sample, taken in 2010, is representative on a nationwide basis, involving 2,365 students from 84 Brazilian schools. The data revealed that young Brazilians are interested in school science, but have little interest in pursuing a science career. There is interest however, in relation to jobs that deal with advanced technology, especially among boys. The international survey had showed negative relationship between the HDI of the countries surveyed and students' interest in science: the higher the HDI, the lower the interest. The results indicate the need to reflect on the possible actions that can be taken in order to narrow the gap between the interest in school science and science career, and to understand the reasons for the existence of this gap.

Keyword: Young people; interest in science; a science career.

Introduction

The decline in interest evidenced by young people in school science and in a career in science has put teachers, academics and policy makers on the alert. Several articles and reports, mainly from the European community, as well as large-scale evaluations, have sought to analyze this issue, bringing elements into this debate and reflecting on this problem (AIKENHEAD, 2004; EUROPEAN COMMISSION, 2007; FENSHAM, 2004; JENKINS, 2006; KENNEDY, 2008; OSBORNE, DILLON, 2008; TOMEI, 2008; SCHREINER, SJØBERG, 2004; VÁZQUEZ, MANASSERO, 2008).

This situation has also been observed in the Ibero-American context, which prompted the proposal of the Ibero-American Observatory of Science, Technology and Society, linked to the Organization of Ibero-American States (OEI), to stimulate young students to follow careers in science and technology (Educational Goals 2021) (OEI, 2010, POLINO, CHIAPPE, 2011).

An interesting reflection on this subject was made by Anthony Tomei in the foreword to the report *Science Education in Europe: Critical Reflections. A Report The Nuffield Foundation*:

[...] “some understanding of the practices and processes of science is essential to engage with many of the issues confronting contemporary society.” Yet in recent times fewer young people seem to be interested in science and technical subjects. Why is this? Does the problem lie in wider socio-cultural changes, and the ways in which young people in developed countries now live and wish to shape their lives? Or is it due to failings within science education itself? (TOMEI, 2008, p.5)

The report presents evidence of a decline in the number of young people electing to pursue the study of physical sciences, engineering and mathematics at a university level in many European countries. From 1993–2003 the percentage of graduates in science and technology had diminished in Poland, Portugal, France, Germany and the Netherlands. There was also a reduction in the number of students who follow an academic career (doctorate), which has led to a decrease in the number of scientists (OSBORNE; DILLON, 2008).

This situation was presented in detail in the report *Europe Needs More Scientists* (EUROPEAN COMMISSION, 2004). The document highlights the concern that among the 25 EU Member States, only in Greece and Belgium (the Flemish part) has no decrease been evidenced in the number of young people choosing to study science in schools.

In the Ibero-American context, a study carried out in the cities of Bogota, Buenos Aires, Lima, Madrid, Montevideo and Sao Paulo, shows that 87% of the surveyed students wish to continue their studies after completing basic education, with major interest in social sciences (28.4%). This situation was observed in the city of São Paulo, where 22.9% declared an interest in the social sciences, 21% in the humanities, 18.8% in engineering and technology, 8.4% in medical sciences and 2.7% in exact and natural

sciences, with 26.3% saying they did not know yet (DEMELENNE, 2011).

One of the topics addressed by the report *Europe Needs More Scientists* in coping with this problem is school science. According to the document, young people are only exposed to science in a systematic, organized and explicit way at school. And it is most likely that early contact with scientific thought will bring a lasting impressions on their perception of the nature of science and their attitudes toward it. The report also states that teaching and learning science in school should increase young people's interest in science and related studies, including future careers and jobs (EUROPEAN COMMISSION, 2004).

Another report organized by the OECD, titled the *Evolution of Student Interest in Science and Technology Studies* (OECD, 2006), showed that in the OECD countries there has been an increase in the number of students in higher education in the last 15 years, but the proportion of students enrolled in science and technology dropped sharply, especially in the area of physical science and mathematics.

Osborne, Simon, and Collins (2003) commented that a possible interpretation for this question is that this is a deeply cultural phenomenon and that the problem is beyond the scope of science teaching. Given that the learning of science is demanding, requires discipline and application, values that contemporary culture has neglected, some factor rests on the issue of teaching. However, the authors comment that the immediate relevance of science in society does not seem to be evident to students.

The authors further stated that the basic condition for the public appreciation of science is the involvement of the public with science – something that is a product of positive attitudes generated through formal scientific education or at least neutral attitudes. Attitudes, once formed, are enduring and difficult to change (OSBORNE; SIMON; COLLINS, 2003).

According to Siegel and Ranney (2003, p. 758), “educational studies have produced mixed results but tend to show that attitudes affect students’ persistence and performance.” The authors verified that students’ attitudes towards science and its relevance can be changed through pedagogical activities specifically oriented to this end. They further emphasize that attitudes toward science are determinants of future involvement and performance in classes and in science career.

Thus, it becomes imperative to know students’ attitudes and interests for science, so that actions that favour and stimulate positive attitudes can be addressed in basic school.

Osborne, Simon, and Collins (2003) report a declining interest in science over the school years, especially since high school. Children in the early grades are more interested in science than young people who complete basic education. This is also evident in Israel (TRUMPER, 2006), where it has been observed that the interest in science, especially in physics, has decreased during schooling.

The report *Science Education Now: a renewed pedagogy for the future of Europe* comments on this:

Science teaching at primary school has a strong long-term impact. Primary school corresponds to the time of construction of intrinsic motivation, associated with long-lasting effects, it is the time when children have a strong sense of natural curiosity and it is the right time to tackle gendered patterns. (EUROPEAN COMMISSION, 2007, p.11).

Vázquez Alonso and Manassero Mas (2008) point to studies that consider that students lose interest in science during adolescence, in the transition from primary to secondary education. The authors commented that during this period, the child's natural curiosity and interest in science began to turn into boredom and disinterest, and school experiences with discipline became faulty, culminating in the abandonment of young people in science careers.

Shamos also addresses this issue by stating:

Why is it in the elementary grades, where the teachers generally are least well prepared to teach science, virtually all children are excited by the mysteries and magic of science, yet when they reach the secondary grades, where, in principle, the teachers are better prepared, they lose interest, many nonscience students even resenting the fact that they are required to take science? (SHAMOS, 1996, p. 1102)

Baram-Tsabari et al. (2009) comment that the decisions of young people about the direction of their academic formation are influenced to a great degree by the interest for themes developed in previous years. The authors comment that the ability to learn also affects the choice of a future career.

However, there is a consensus that all education must be built on the child's interests and experiences. In order for the teaching content to be meaningful for the student, it must have some kind of relevance and fit the student's personal and social context (SJØBERG, 2000).

The international project "The Relevance of Science Education" (ROSE) led by Professor Svein Sjøberg (Norway) brought results that relate the interest in the natural sciences to economic development, based on the Human Development Index (HDI). According to Schreiner and Sjøberg (2005), sample data from several European, American, African and Asian countries indicates that the higher the HDI value of a country, the lower the interest of young people in the sciences. And the reverse is also true: the lower the HDI, the greater the interest of young people in science.

This project aims to ascertain the relevance of scientific and technological knowledge for young people who are finishing compulsory studies (around 15 years of age). The project was translated and applied in a collaborative way by several researchers around the world and its instrument of data collection – a closed questionnaire with 245 items – has already been applied in more than 40 countries (SCHREINER and SJØBERG, 2004).

In Brazil, the ROSE project was first applied in 2007, involving 625 students from two municipalities in the states of São Paulo and Mato Grosso (TOLENTINO NETO,

2008). The nationwide application of the ROSE project in Brazil, object of the study described here, was carried out between 2010 and 2011 and covered 2,365 students from 84 schools distributed in all states of the country.

One fact to be highlighted in this research is that it sought to know the interests of the students. These, admittedly fundamental for the engagement of young people in school activities and in the continuity of academic trajectory (ALSOP, WATTS, 2003; PELL; JARVIS, 2001; WADE, 2001), are not usually studied in Brazilian national researches.

This article presents some results obtained through the application of ROSE project in Brazil, carried out in 2010, with the following objectives: a) to verify the global interest of Brazilian young people in school science and b) to verify the interest of Brazilian young people for a career in science and for a job dealing with advanced technology. From this, comparisons are made between the results of the Brazilian young people and those of other countries that participated in the international sample of the ROSE project.

Research Methodology

The research described here is situated in the field of educational evaluation. The educational evaluation is not restricted to the application of tests aiming at an investigation of the proficiency of the student in a certain subject. According to Vianna (1992, p. 100), student-focused assessment may be focused on both cognitive (formative and summative) and non-cognitive aspects such as “attitudes, interests and aptitudes”.

Buriasco (2000, p. 156) highlights the diversity of objectives of the current educational evaluation, such as “subsidizing the teaching and learning process, providing information about students, teachers and schools, acting as a support for certification and selection and guiding Educational policy-making”.

Methodologies of educational evaluation at the nationwide level imply approaches of a quantitative nature. Of these, it is interesting to note the scarce literature in the country. Gatti (2004, p.13) states that:

For more than two decades, disciplinary studies on these methods have not been contemplated in the training of educators and teachers and doctors in education. However, there are educational problems that, for their contextualization and understanding, need to be qualified through quantitative data (GATTI, 2004, p.13).

The author considers that quantitative studies contextualized by theoretical perspectives provide subsidies for educational phenomena to be dealt with beyond the casuists and ungrounded opinions constructed from common sense, bringing concrete elements to the confrontation of policies, planning and orientation of pedagogical actions (GATTI, 2004, p.26).

Thus, the research presented here consists of the implementation of the ROSE project in Brazil, in a nationwide scope, in 2010, through the application of a questionnaire

in 84 classes of the 1st year of High School, coming from all Brazilian states, which totalled a participation of 2,365 students. Details on the data collection instrument and its application are described below.

It is worth noting that, for the comparative discussion of the Brazilian results in relation to the other countries participating in the ROSE project, data already published in reports and articles were used by the international coordination of the project (SJØBERG; SCHREINER, 2005; SJØBERG; SCHREINER, 2009, SJØBERG; SCHREINER 2010; SJØBERG, 2007).

Data collection instrument

The educational evaluation described in this research had the objective of knowing students' interest in school science and a science career through the application of the ROSE instrument, a questionnaire with closed questions regarding affirmations about science, in which the student is invited to indicate his degree of interest in a four-point Likert scale.

This instrument, developed by the organizers of the project in Norway (SCHREINER; SJØBERG, 2004), was adapted to the Brazilian context by Tolentino Neto (TOLENTINO NETO, 2008).

The questionnaire consists of 245 items distributed in 8 sections named by letters (A to H). In Brazil, 23 specific questions on religiosity and acceptance of biological evolution (sections I to N) were included, which will not be addressed in this article.

The sections that bring information about the interest in school science subjects, which are the subject of the research described here, comprise 108 items distributed in 3 sections (A, C and E) of the ROSE questionnaire. The items consist of short and simple statements about various subjects and themes, as seen in Figure 1.

A. What I want to learn about

How interested are you in learning about the following?

(Give your answer with a tick on each line. If you do not understand, leave the line blank.)

	<i>Not inter- ested</i>		<i>Very inter- ested</i>	
1. Stars, planets and the universe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Chemicals, their properties and how they react	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The inside of the earth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 1. Section A (part) of the ROSE questionnaire applied in Brazil.

The Likert scale used has four options – from not interested to very interested – without neutral choice. The choice of a four-point scale, rather than five, as the classic Likert scales are, is related to the fact that the neutral option often misinterprets: it may indicate a central point between extremes but also a lack of knowledge or understanding

of the issue, indifference or even lack of motivation. Thus, in the case of the ROSE questionnaire, the student is instructed not to answer when he does not understand the question or when he does not want to answer the question (SCHREINER; SJØBERG, 2004).

The average of the answers obtained represents disinterest or interest in the presented questions. An average below 2.5 represents disinterest, and above that, interest. As the questions assume limited values, one cannot assume homogeneity of variances (homoscedasticity). The use of statistical tests that assume data normality is impracticable and, for this reason, non-parametric tests were used. Mann-Whitney tests were used to verify differences between genders. Differences with p values <0.05 were considered significant; 95% confidence intervals were estimated for the means and difference between the means (BISQUERRA; SARRIERA; MARTÍNEZ, 2004).

The data collection instrument was printed on notebooks with optical sheets, where the answers are prepared for reading through *Intelligent Character Recognition* (ICR), which provides automatic data capture. Each answer book was personalized with a bar code, which allowed its easy location, given the anonymous nature of the instrument.

The use of this system was a Brazilian innovation for the ROSE project, and contributes with the agility of data tabulation, since it is performed by automatic reader and in the reduction of errors from manual tabulation.

Target population

The target population of this research was the students who were completing compulsory studies and beginning the last stage of basic education, in which they would have to make decisions about their professional futures, in year of 2010. It was agreed that all the countries participating in the project ROSE would elect the school grades where they would ideally be expected to meet 15-year-old students. In the Brazilian case, this norm was translated opting for the application to young people of the first year of High School.

To define a sample of nationwide significance, the Brazilian sample of the International Student Assessment Program (PISA) from 2009 was used as reference, so that the same characteristics and representativeness of the original sample were maintained.

The option to have as reference the sample PISA 2009 was due to the fact that it is statistically significant on the Brazilian student population. In addition, there is proximity between the target audience of the ROSE survey and the PISA survey, and information from participating PISA 2009 schools can be accessed through the National Institute of Educational Studies and Research Anísio Teixeira (INEP).

Due to the present study being carried out in schools, it was necessary to apply the questionnaire to student groups, not to individual students. In this way, a 1st year high school class was selected in each participating school unit, with an estimated average

size of 30 students, being as criterion of choice the presence of 15-year-old students in the majority.

Sample size and data collection

Considering the sample universe described above, an initial sampling plan was prepared involving the draw of 160 school units distributed in all Brazilian states. All students in the selected schools (average of 30 per school) were to be included in the sample. Considering a loss of 20% of the schools that were drawn and 10% loss of the students within schools, 128 schools and 27 students in each school were to be surveyed, resulting in 3,456 completed questionnaires.

Estimates of proportions calculated for this sample size correspond to obtaining estimates with a sampling error between 3 and 4 percentage points (3 being the equivalent of 2,160 questionnaires and 4 being the equivalent of 3,841 questionnaires), which is considered satisfactory for a nationwide survey.

The data collection period began in July 2010. Although most of the data were obtained that same year, it was necessary to supplement the sample the following year, when, in September, the number of completed questionnaires was concluded.

The questionnaires were sent to the schools by mail, together with the Informed Consent Form, indicated by the Ethics Committee of the School of Education of the University of São Paulo, the institution responsible for the ROSE Project in Brazil, as well as sealed envelopes for the Return of completed questionnaires.

At the end of the collection period, 2,365 completed questionnaires were obtained from 84 schools located in all Brazilian states, a number that fell within the range corresponding to the estimated sampling error, between 3 and 4 percentage points initially foreseen.

Description of the sample obtained

Among the participating schools, 96% are located in urban areas and 4% in rural areas. Regarding administrative dependence, 88% are state-owned public, 4% are federal public, and 8% are private.

Among the young participants (valid answers), 57.6% are girls and 42.3% are boys, all of whom are the average age of 15.39 years.

For the knowledge of socioeconomic information, the questionnaire had two questions: one related to the possession of books and another related to the number of bathrooms present in the student's home. It was observed that, in the Brazilian context, 71% of students have less than 50 books at home, which indicates restricted access to a relatively common and widely distributed cultural asset, such as textbooks. The range where the highest percentage (37%) was concentrated was 11 to 50 books. In relation to the number of bathrooms, in the homes of students from all Brazilian regions, the occurrence of one bathroom was more common.

Results and discussion

Does the young Brazilian want to learn science at school?

The global interest in learning science topics is verified in the scope of the ROSE Project through the average obtained from the 108 questions that comprise sections A, C and E (ACE) of the data collection instrument, grouped under the heading: “How interested are you in learning about the following?” These issues involve diverse areas and themes of the Natural Sciences, such as Chemistry, Physics, Biology, Human Body, Geology, Astronomy, etc.

Thus, we present here some aspects directly related to the issues of the ACE sections, which were discussed in international comparative analysis of the ROSE project, and the position of young Brazilian in relation to youths of other nations.

The global interest in learning topics of science, expressed through the simple average of points 1, 2, 3 and 4 of the Likert scale, was published by Sjøberg and Schreiner (2010). The Brazilian data were included in these results in a prominent way, as can be observed in Figure 2

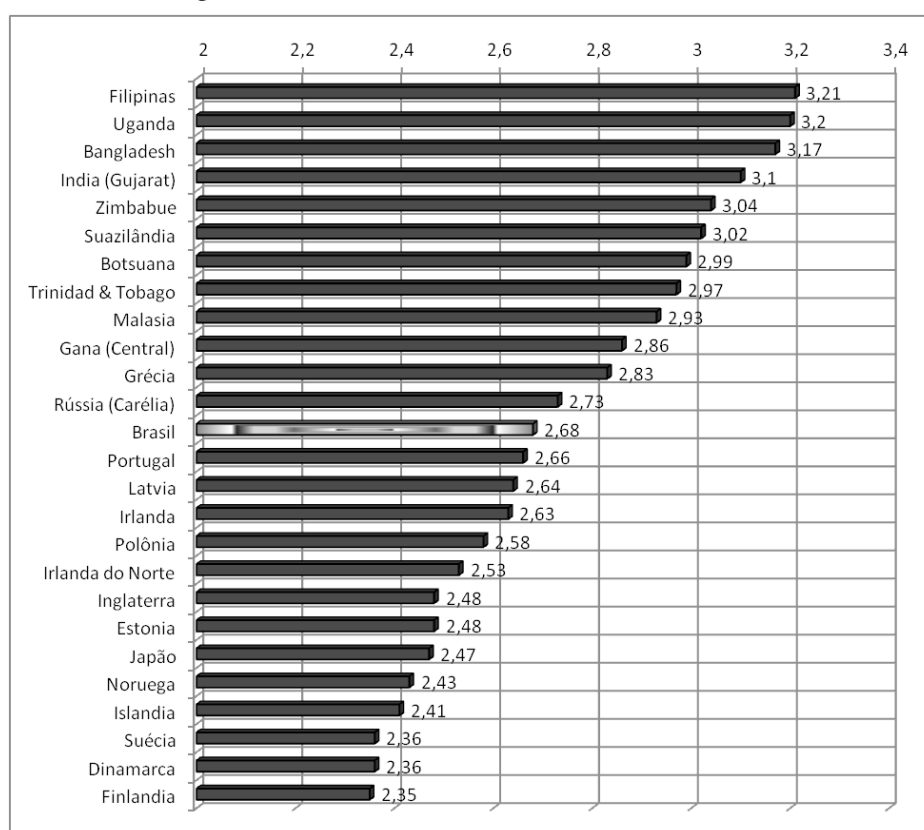


Figure 2. Average obtained by ROSE participants in the 108 questions in the ACE sections. Figure adapted from Sjøberg and Schreiner (2010).

Considering that the average of the scale used is 2.5, it is observed that the young

Brazilian has an interest in learning science in school, since the average obtained is above the average of the scale.

Sjøberg and Schreiner (2005) verified that data collected through the ROSE project showed a strong relationship between the Human Development Index (HDI) of the participating countries and the students' responses expressed in the global averages obtained with all items in the ACE sections. The Pearson coefficient obtained was -0.85, indicating that there is a strong negative correlation between the HDI and the average of the ACE items (SANTOS, 2007). Thus, countries with high HDI have a tendency to present averages in the smaller ACE section and countries with low HDI, show larger averages. Figure 3, published by Sjøberg and Schreiner (2005), illustrates this trend.

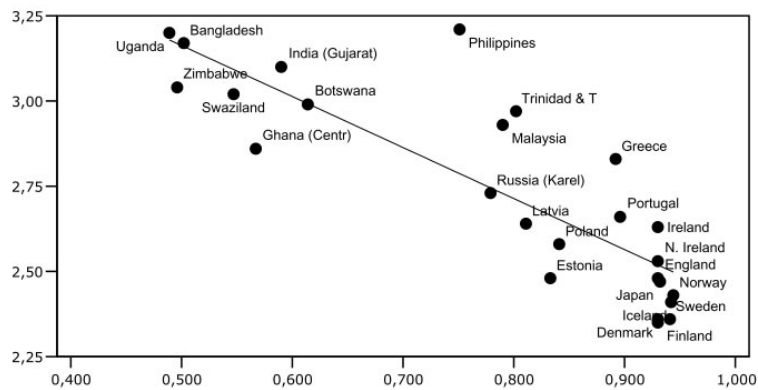


Figure 3. Regression line obtained from the HDI (horizontal axis) values and the overall average score in the ACE (vertical axis) items for ROSE participating countries.

Source: Sjøberg and Schreiner (2005, p.14).

The inclusion of Brazil in the above analysis resulted in a Pearson coefficient of -0.857, indicating that the trend observed by Sjøberg and Schreiner (2005) remains the same. The regression line obtained and the Brazilian position can be observed in Figure 4.

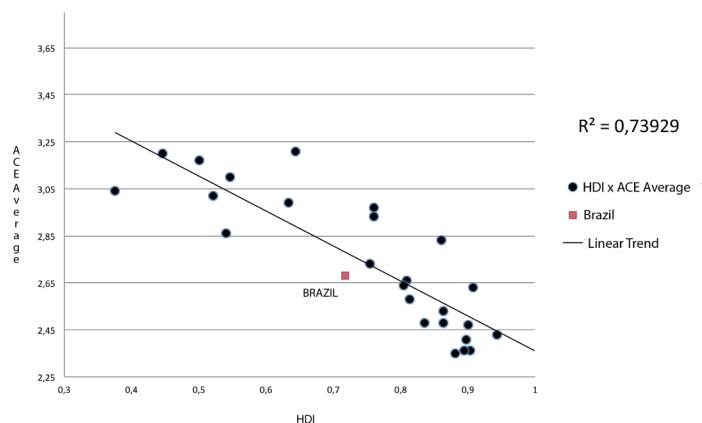


Figure 4. Regression line obtained from the HDI values and the overall mean score on all items of ACE issues for ROSE participating countries including Brazil.

Source: authors.

Sjøberg and Schreiner (2009) pointed out that there is a general pattern for the 108 items in the ACE sections “What I want to learn”: that is the more developed the country, the global interest of its young people in science is lower, or the more developed the country, “the more selective are its students”. According to Sjøberg and Schreiner (2005), an important challenge for localities with low HDI is the improvement of material conditions and economic growth, since science is perceived by its young people as important for society and thus meaningful for the individual.

As for the gender differences between the participating countries, the authors indicated that boys (and not girls) are interested in technology, mechanics, electricity, spectacular phenomena (such as explosives or violent). On the other hand, girls (and not boys) have a keen interest in health and medicine, beauty and the human body, ethics, aesthetics, discoveries and supernatural phenomena (SJØBERG; SCHREINER, 2009). These data were also observed among Brazilian young people, through data collected nationwide in 2010.

Sjøberg (2007) points out the importance of paying attention to scientific issues that are implicitly addressed in the science curriculum: the role of science in society, the work of scientists, the nature of scientific knowledge, and so on. Such questions are most likely to influence students’ attitudes toward science.

From this viewpoint, several items in the ROSE questionnaire were determined as being emblematic and meaningful for a comparative analysis among the participating countries, aiming at unveil certain hidden aspects of school science. One of them is the question “Famous scientists and their lives” (question E37). This issue is considered emblematic because the interest of young people in scientists and their lives may indicate an interest in science careers. Figure 5 shows country averages for question E37. This figure was adapted from Matthews (2007) and seeks to include the results obtained with Brazilian young people.

It is observed that the Brazilian average is low, and is situated between the European countries of the Czech Republic and Latvia (Latvia). There is also no significant difference between girls and boys. These data indicate that the position of the Brazilian youths was similar to that of the group of countries located in the central region of the chart between Greece and the Czech Republic.

Thus, we observe that young Brazilians have an over all interest in learning science at school. The trend observed among ROSE participants, which relates countries with a high HDI to young people’s low interest in science (SJØBERG; SCHREINER, 2009), is maintained when Brazil is included. Even with an above-average interest in school science, young Brazilians show little interest in scientists and their lives.

The over all interest of young Brazilians in learning sciences at school as evidenced by the research is a relevant fact, since it demonstrates a result differing from the explicit trend evidenced in studies and international reports in Europe, which in recent decades have pointed to increasingly negative attitudes of students towards school science.



Figure 5. Students’ Answers on Interest in “Famous Scientists and Their Lives” - Question E37.

Source: the authors (Adapted from Matthews (2007)).

The nature of the study presented here allows us to infer that students’ attitude is positive in their desire to learn science in school. However, it does not allow us to conclude the reasons for this. The Brazilian data contributes by providing subsidies for future studies that would relate students’ perception about school science and the factors that determine their involvement with science, in order to support the development

of a more encompassing scientific curriculum, enabling the expansion of pedagogical strategies to be used in the initial and continuing education of science teachers, in order to maintain and expand this desire to learn science at school, as revealed by the research.

Is the young Brazilian interested in the scientific career?

Two questions in the ROSE questionnaire asked directly about the future: interest in the career of science (question F14) and interest in a job dealing with advanced technology (question F16). We observed that both girls and boys have little interest in entering a science career in Brazil, since the average obtained in this question is less than 2.5. In addition, boys would rather have a job that deals with advanced technology than girls (average greater than 2.5). Figure 6 illustrates the difference between boys and girls in relation to their interest in science and technology careers. For both questions, the difference between boys and girls is significant, since the p-value of the difference is 0.001.

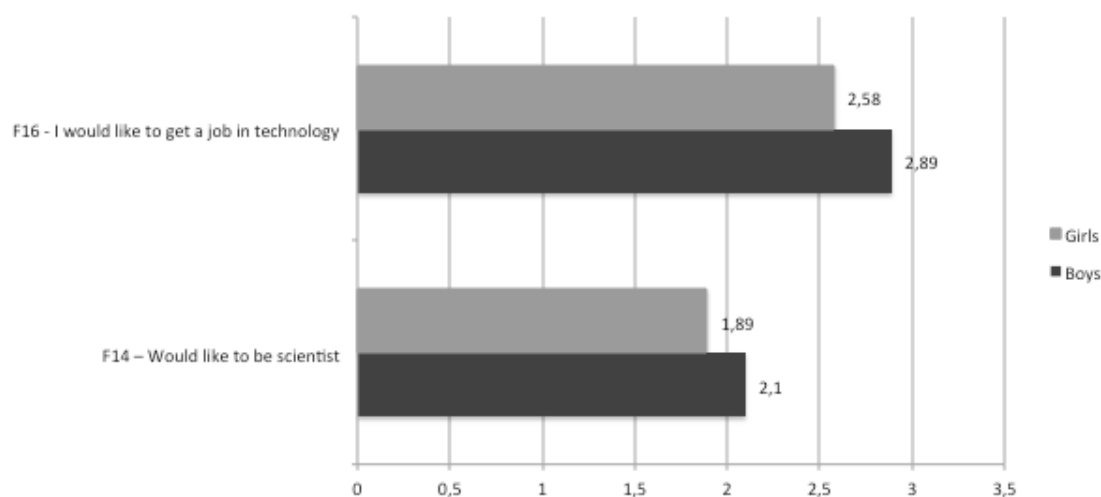


Figure 6. The interest of boys and girls in science and technology careers, expressed through the means of questions F16 and F14.

Source: authors.

The first application of the ROSE project in Brazil brought an interesting observation: the interest for the science career was higher in the municipality with a lower HDI, Tangará da Serra (MT) than in São Caetano do Sul (SP), the municipality with the highest HDI. São Caetano do Sul (SP), with the highest HDI in Brazil (UNDP, 2016), obtained averages close to countries such as Norway, Denmark and Sweden (TOLENTINO NETO, 2008).

The data are in line with international data, which indicate that the higher the HDI of a country, the less interest in the scientific career. The author concludes that “most probably in these students from less industrialized regions lies the idea (and why not say hope) that Science is the answer and the solution for development and for a

better life” (TOLENTINO NETO, 2008, p.89).

To determine whether there is a relationship between interest in a science and technology career, as expressed through the averages of questions F14 and F16, and the socioeconomic situation of the Brazilian national sample, obtained through the research described here, two types of analysis were performed: a) Correlation test between the HDI of the municipalities participating in the research and the means obtained in questions F14 and F16 and b) chi-square test to verify association between the answers given to questions F14 and F16 and the socioeconomic questions present at the beginning of the questionnaire (number of books and number of bathrooms). The results can be seen in Tables 1 and 2.

Table 1. Values obtained for the correlation test between HDI of Brazilian municipalities and average of questions F14 and F16.

Municipality vs HDI	Pearson's coefficient	Type of correlation
Average F14	-0.08986679	Tiny negative
Average F16	-0.3608768	Weak negative

Source: the authors

The data in table 1 indicate that there is no correlation between the HDI of the Brazilian municipalities, that were participants in the ROSE project, and the values assigned to questions F14 and F16. The results of the association analysis between questions F14 and F16 and socioeconomic issues (number of books and number of bathrooms) are shown in table 2.

Table 2. Results obtained from the association between the answers of questions F14 and F16 and number of books and number of toilets.

Association between answers	p-value (chi-square test)	
	Number of books	Number of bathrooms
Answers F14	0,358	0,422
Answers F16	0,221	0,927

Source: the authors

The values obtained for the p-value are over 0.05, which indicates that there is no association between the answers of the socioeconomic questions and the questions F14 and F16.

The observation of answers by region of the country points out that there is a significant difference between the averages assigned to question F16, as observed in table 3.

Table 3. Averages by region of questions F14 and F16.

Questions: “My science classes”	Midwest	Northeast	North	Southeast	South	P-value
F14 – Would like to be scientist	2.03 ± 1.16	1.99 ± 1.13	2.06 ± 1.15	1.89 ± 1.06	1.87 ± 1.06	0,049
F16 - Would like to have a job that deals with advanced technology	2.60 ± 1.17	2.81 ± 1.16	2.88 ± 1.09	2.59 ± 1.13	2.44 ± 1.12	0,001

Source: the authors

Thus, it is observed that students in the South and Southeast regions have less interest in a the technological career (question F16) than in the other regions.

Some hypotheses try to justify this trend. Sjøberg (2001) considers 13 possible reasons why young people do not opt for science careers: 1) theoretical, abstract, authoritarian and irrelevant science curriculum for students; 2) the great effort involved to learn science, a fact that is not highly valued among today’s young people; 3) lack of qualified teachers, especially in high school; 4) alternative beliefs, of a superstitious, metaphysical or even supernatural appeal that go against scientific activity; 5) postmodern attacks on science and technology, based largely on alternative beliefs; 6) stereotyped image of scientists and engineers as boring, closed and authoritarian people; 7) disagreements among scientists themselves about scientific issues involving society, such as global warming, environmental preservation, etc.; 8) lack of ethics in scientific activity; 9) non- appreciation of the overvaluation of science in activities such as biotechnology, which may pass the idea of the scientist wanting to “play God”, going beyond human limits; 10) changed role the role of scientists, from great “discoverers” to collaborators of industrial and warlike activity; 11) changed image of the scientist from hero to villain, responsible for the great evils, befalling humanity, mainly environmental; 12) the unglamorous life of scientists, which has little appeal to young people, who have artists, musicians and sports men as models and 13) failures in communication between science and the general public.

Nowadays, an issue worth noting is the trend to overrate everything that is natural in relation to consumer goods, from the option of organic food to neutralization of carbon dioxide emissions. This appeal may imply an anti-scientific and anti-technological stance, which influences young person in some way. In addition, the young man, when reflecting on the future, envisions a scenario in which scientists have little expression in the labour market.

Such hypotheses constitute conjectures that merit in-depth studies in order to ascertain which issues have in fact influenced the opinions of young people.

We cannot, however, avoid the importance of the role of the school in fostering

interest in a science career. Vázquez Alonso and Manassero Mas (2009, p.215) comment that:

Choices for S & T careers depend significantly on science education and school content, which can develop curiosity, interest and taste for science as much as the opposite, boredom, difficulty, and failure that lead to disinterest and rejection (VÁZQUEZ ALONSO; MANASSERO MAS, 2009, p. 215).

Polino, Chiape and Castelfranchi (2011) considered in research targeted to young people in relation to their perceptions about science and the science and engineering career, that science classes influence the career decision of those who would like to be scientists. Science classes also have a great impact on those who, without choosing science, see engineering, medicine or teaching careers in a positive way.

The data obtained from the ROSE questionnaire pointed out that the young Brazilian considers science in basic education to be interesting subject, however this is not correlated with the choice of a career in science. Future studies, seeking to understand the gap between interest in the subject vs. the lack of interest in the career, will be useful for understanding the data presented here, and may bring contributions that will stimulate the Brazilian's to enter a career in science and technology.

The overall Brazilian average for school science (see Figure 2) was higher than that of the young people in Portugal, Latvia (Latvia), Ireland, Poland, Northern Ireland. It was also higher than the averages of the young people in England, Estonia, Japan, Norway, Iceland, Sweden, Denmark and Finland. In these countries, the over all average was less than 2.5, indicating a lack of interest in the subjects.

The research on public-perception of science conducted by Fundação de Amparo à Pesquisa do Estado de São Paulo – FAPESP, pointed out the need to establish relationships between the understanding of young people about the role of science and technology in society and its relation to the choice or not of a career in science. For the authors, the science career is often mythic, which may influence the decision making of young people (FAPESP, 2011).

The ROSE research described here pointed out that the young Brazilian considers school science interesting, which is already a principle for the deepening of the question of the lack of interest in the scientific career. The interest in school science is one of the paths taken to reach academic science. It remains to be ascertained at what point in time, or what elements in it, influence young people in determining their options for the future.

Final Considerations

This paper sought to listen to what Brazilian students have to say about school science and scientific and technological careers. In all, 2,365 young Brazilians gave their opinions on such subjects, making it possible to verify that they, in general, have an interest in school science and technological careers. On the other hand, the interest in a

career in science was considered slight.

In order to legitimize the considerations expressed by these students, it is necessary to reflect on possible action that can be taken to order to narrow the gap between the interest in school science and a science career, and to understand the reasons for this distance.

Research that seeks to understand the reasons why our young people have little interest in entering the science careers will be important even for understanding the dynamics in the classroom, so that actions that stimulate and favour the choice of science can be identified and stimulated.

Baram-Tsabari and Yarden (2005, p. 803) highlight the relevance of research aimed at student interest: they “make school science more attractive to the student and verify how attitudes and interests affect the learning of scientific knowledge” and their future choices.

Faced with such a complex picture, Osborne (2006) states that there is no simple or unique answer to the question. The health of science education depends on our ability as a community to help define and provide information for the debate regarding what kind of science education should be offered to young people, and in what contexts. These observations are of relevance when discussing adoption of a National Curricular Common Base and the need to take into account different aspirations, interests and attitudes of students from different parts of the country.

Thus, it is necessary to focus on this subject so that school science can be meaningful and significantly important for the student thus stimulating him to continue his future studies and contribute to a sound and conscious continued education in science.

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