

MATHEMATICAL TALENT OF YOUNG CHILDREN

La Real Academia de Ciencias Exactas, Físicas y Naturales, Spain

The detection and stimulation of children's mathematical talent is an educational project being undertaken by the Spanish Royal Academy of Sciences. The aim is to show children what mathematics really means.

In 1998, the Royal Academy of Sciences decided to get involved in a problem of great importance to the scientific progress of the country. This article outlines the main ideas behind this decision.

Without doubt, in any of the important cities of the country each year there are more than twenty children of about thirteen years of age with a very special talent for mathematics. What will happen to them? If no particular line of action is taken, they will most probably suffer through their years at school, frustrated by not having their talent recognized, even by themselves. Their special abilities will be unproductive for the community in which they live. Moreover, it might even be the case that the boredom they have to experience will lead some of them to academic failure.

What would happen if an official institution could in some way pay attention to their guidance? Surely it would be bring about intense satisfaction for them and, in the long run, great benefits to society and the advance of science and technology in the whole country. Some might think that the fact that an official institution would take special measures in favour of such children would contribute to promoting elitism. One can easily observe, however, that exactly the opposite happens. If no measures are taken, then it will often be only

those children from affluent families who are able to develop their talents and achieve success. Social justice and attention to the common good should lead to an active involvement in this problem by those who share the responsibility of running the educational policy. The costs of such an action would not compare to the benefits it would bring. The society that is successful in channelling the talents of its members will certainly go much further than the one that remains indifferent. The Royal Academy of Sciences started out with a pilot program with a reachable goal: to identify twenty-five children each year, aged twelve or thirteen, from the region of Madrid, with a special talent and enthusiasm for mathematics, and to give them, for a certain period of time, the opportunity to properly develop these qualities.

Several different problems should be confronted: talent detection, the organization of activities for the children that could be compatible with their normal development, the selection of adequate monitors, the financing of the project, and so on.

The road taken by the Royal Academy

Luckily there have been many countries in which a great deal of attention has been paid to this problem. Their experience has paved the way for the initial actions taken by our Academy. Among the many possible ways of handling the problem, the Academy has opted for a method similar to those initiated first at Johns Hopkins University in Baltimore, USA, and later followed by the city of Hamburg, Germany.

We try to detect, stimulate and guide the mathematical talent of about twenty-five children, aged twelve or thirteen, in one of our big cities, without separating them from their environment. This should be done in a continuous way, i.e. not merely by specific events such as competitions etc., but by means of a steady line of activities. The method chosen consists of three-hour meetings on each Saturday of the academic year. The age group (twelve–thirteen) has been considered the most appropriate for different reasons. It is more or less the time of the awakening of formal reasoning. In addition, experience in other countries that have guided us involved work with children of this age. For practical reasons, we thought the pilot project should start with children in the Madrid area.

The selection is made according to the following steps: the project is promoted in the month of April each year at all centres of primary and secondary education by a letter that encourages all teachers to send their best students to the project. In addition, the attention of parents is gained through

several announcements in newspapers. At the end of May the candidates (usually about three hundred) undergo a special mathematical aptitude test. Its goal is not to assess their mathematical knowledge, but their mathematical abilities.

After the initial selection, separate interviews with the children and their parents are held. Through this, we try to evaluate the degree of enthusiasm among the children and parents for being included in the project and their willingness to make the effort it requires. It is to be emphasized that the project implies no cost to the children's families, but the parents do have to make a considerable effort in bringing the children every Saturday morning and picking them up three hours later. After the children have been selected, in the month of September, they get to know each other and also the teachers involved in the project at a weekend meeting in the mountains close to Madrid. The main activity of the project with these children lasts for two years and takes place at the Facultad de Matemáticas, Universidad Complutense de Madrid, which has generously offered its enthusiastic support and its facilities to this project from the very beginning. Each Saturday the children participate in three hours of mathematical activities that have little to do with their syllabus at school. Under the guidance of two highly selected teachers (some of them university professors and others very competent secondary school teachers), they explore subjects such as graphs, number theory, strategies for mathematical games, interactive geometry with the computer, and so on. The children work in groups of four and are usually very interested in, and satisfied with, their activities.

After the first two years of intensive dedication to the project, the children pass to a second phase. They come to the project once a month on Saturdays and explore deeper and more sophisticated mathematical activities.

Financing

For the initial three years (1998–2001), the Spanish Royal Academy of Sciences funded the project, with around €30,000 per year. From 2001, the Fundación Vodafone entered into the organization and financing of the project, providing €50,000 per year, thus covering all its expenses.

Results

It seems too early to undertake a serious evaluation of what effects a project of this type will have. A period of four years is too short to assess the long-term impacts of a project, one of the aims of which is the improvement of the quality

of research performed by the scientific community. But one can truly say that the short-range goals of the project are being reached with complete success.

The degree of depth achieved by some of the children and their creativity in different aspects of mathematics leads one to predict that, in the long run, their involvement in the project can be decisive in strengthening and reinforcing their orientation towards mathematics research in different fields, and so they will be able to contribute substantially to the scientific and technological progress of our country.

But what the project has already truly fulfilled in its current state is now quite obvious. It has afforded these children a deep vision of what working with mathematics means, a vision that fills them with plenty of satisfaction. And this was the main goal that the Spanish Royal Academy set out to achieve with the project.