



Research works and the CIRIT awards: scientific talent in secondary school

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The search for talent is not and must not be up to higher education and business only. The daily task of educating and stimulating pupils done by teachers in compulsory secondary school and also in high school is still a key to have a successful human capital in an increasingly global world where distances between cultures are becoming ever shorter. I will try to point out the paramount role of teachers and the importance of research works and the CIRIT awards to foster a scientific spirit among the youth, especially as a tool to detect talent in secondary school.

In this stage, talent has to be treated as a potentiality rather than a given fact, especially because in this phase of education the individual has a whole set of abilities and skills they have not been able to develop yet or even may never discover due to a social, family or personal environment that is not fully suited to lay open such capacities. It is here where teachers play a crucial role in detecting or forging such potential, momentarily invisible talent.

Talent, which can be either inborn or acquired, is often not easy to recognise phenotypically, even less in an educational system that encourages cognitive indolence in those pupils with more potentialities. It is easy to state that this hampers considerably post-compulsory education, and it is here where, based on my experience, I can give some clue of how to detect and develop such talent and have pupils become aware of their own abilities.

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Although there are many initiatives in higher education to detect, seize and internationalise talent (cf. National Pact for Research and Innovation, *Paradigmes*, no. 0), it is still necessary to implement strategies in secondary education to develop it in all its aspects (linguistic-verbal, logical-mathematical, corporal-kinesthetic, visual-spatial, musical, emotional, naturalist and existential).

Though it may appear surprising, there are certainly many tools available at schools to work on talent. Experimental science class, business practices, research works, exchange, initiatives like the Heura programmes, internet in the classroom and radio at school, teacher training plans and school autonomy are, among many others, some initiatives geared at facilitating the creation and development of talent in a phase of adolescence full of complexities. In spite of that, school planning purely based on budget criteria does often not allow to use the available resources nor to develop all tools we could have at hand, which leads to misuse of resources that do not even serve the purpose those programmes were originally designed for. As a consequence, talent as an expression of emotional intelligence cannot be properly developed due to circumstances beyond the reach of schools

such as lack of human resources or uncertainty about the continuity of projects and long-term clarity in meeting the targets set by the Department of Education.

Based on my experience as a secondary school teacher in experimental sciences, I can say that research works are among the best things that have been implemented for talent self-recognition. The recent inclusion of a similar piece of work into the 10th grade curriculum is essentially a step forward in the new Education Act the result of which is to be seen in the years to come. Nevertheless, teacher involvement plays a very important role in the common task of doing research in secondary school in order to foster the pupils' capacities and have originality, which we could perfectly call *innovation*, become stringency, in collaboration and across all levels, all of which is basic in research.

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Along these lines, the CIRIT awards, like many other initiatives created later at municipal, county, national or international level, are an additional incentive to this task. This initiative, created in 1982 by the Interdepartmental Council of Research and Innovation in Technology, has become a landmark in Catalonia, giving awards to a part of those works being a result of a well-thought and structured task over more than one course.

The quality of the award-winning pieces of work is a positive surprise, and sometimes they have been the germ of later professional research lines and even PhD theses. In my specific case, I can state that the fact of being part of a Quality Research Group at the University of Barcelona has helped me to take some of these research works to have a first approach to questions coming up within our team. However, it is not necessary to work at university to have

an exchange of information between schools and faculties, which I personally consider very enriching.

Also, there are two important things to point out: first, the involvement of pedagogic resource centres and second, cooperation between centres. Local demonstrations of research work done in the wake of the CIRIT awards thus encourage an exchange of ideas between teachers as well as discussion and later resolution of common problems in similar settings. All this allows definitely a better quality in research year after year.

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Although it is true that most pupils doing well at school are able to do good research works, my experience as a coach to such studies has taught me that it is not necessarily the best school records that yield a good research work. I would even go as far as saying that most of my award-winning pupils have been academically average or even rather poor. In such cases, being acknowledged with an award like CIRIT surpasses the goal of the very research work as it is an additional boost of self-esteem for pupils doing poorly at school but having talent and interests the educational system is unable to assess in everyday life.

Although there are quite some methodologies of and approaches to knowledge and research, I think that a scientific method needs to be applied in experimental sciences in secondary school. With my pupils I always follow specifically the same strategy in the initial stage of work. As a coach, I suggest a whole range of possible studies because I consider that they are of interest to pupils but also to me as a teacher or researcher. They can also be interesting subjects for the educational community or the municipality or county where the school is located.

These studies usually raise general questions that allow different approaches and, more importantly, leave the pupils unclear about what the outcome of the work will be. It is a whole set of proposals that initially suggest just a field of work, that is, an area of interest for pupils. What may seem anachronistic as to what a piece of research is about has two important aspects in order to work properly. On the one hand, hours need to be devoted during the course to motivate, raise the curiosity of and approach pupils to a world completely unknown to them as is research – not from a formal point of view, but from the perspective of knowing their close environment, see what problems are out there and learn that all fields are interrelated, that they are not isolated and that cross-disciplinarity in science is basic. This latter aspect requires big efforts from pupils unused to such argumentative thoughts, so it would be good not to do any academic assessment of this issues. What is to be done is to stimulate, draw the attention to and lay open this theoretical curiosity we all primates have, though it seems to be hardly considered in present-day society.

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On the other hand, when choosing the piece of work, pupils need to have decided on an area of interest to do their research, even if they do not know what to do nor when or how. As I said before, this is crucial. This is the time when the coach intervenes, but indirectly, so it is the pupil who comes to their own conclusions. And I feel it is basic that it is them who pose the initial question they want to work upon, and it is very important not to put limits neither to typologies nor to questions to be raised.

Of course pupils propose in most cases pieces of work with extremely daring targets, but this is not a problem. It is usual to pose theoretically unachievable goals, and in some cases they may

turn out to be feasible. It is just a matter of scale, imagination and involvement of the teacher and the pupil. In this respect, it is important that all resources at school are available to pupils to do whatever. Tools and resources shall wear out of use, not age. This requires additional hours of work for teachers, but the reward always turns out to be immense. If a group of pupils decide to spend the breaks in the lab doing small experiments, watching how certain species act in the aquarium or searching information on the internet, this creates the feeling of having been able to draw the interest and raise the talent of pupils that may develop professionally later on. It also has to be considered that the important is not the amount of previous knowledge but to see how this knowledge is structured. In this respect, the teacher needs to be able to see how to use the pupils' cognitive foundations to their own benefit.

And it is also basic that it is the pupils who eventually formulate hypotheses and even take wrong decisions. Then the moment will come to redirect them, to confront them with new situations and to show them what the wrong decision was, always using a constructive knowledge methodology. In many cases, the choice, collection of data and control of variables is complex and tedious. The involvement of the teacher,

pointing towards the usefulness of gathered data, no matter how unimportant they may be, can help to prevent disappointment. We need to consider that experimental research works require lots of dedication and effort.

This framework may seem utterly utopian, but the truth is that experience has taught me that it works. As an example, I can say that some pupils I have worked with in secondary school have ended up doing research with me at university, while others are enjoying science in a wider sense, which is as important or more.

With time it has become apparent that research works and the CIRIT awards stimulate talent and acknowledge a task that is often undervalued. It is obvious that, related to university, Bologna will bring about more mobility and competitiveness, and it is along these lines that it is becoming more important to have initiatives such as these awards in order to encourage future researchers who later become able to convey the values and meaning of scientific research to our society. This is why these awards are currently considered a landmark for secondary school pupils and future researchers who will become the exponent of our country's human capital in the future.

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