

Science Fairs in Non-Disciplinary Curricular Areas

Zita Esteves⁽¹⁾, Manuel F. M. Costa⁽²⁾

⁽¹⁾*Externato Maria Auxiliadora*

Avenida S. João Bosco, 365, 4900-896 Viana do Castelo, Portugal

zita.esteves@gmail.com,

⁽²⁾*Departamento de Física, Universidade do Minho*

Campus de Gualtar, 4710-057 Braga, Portugal

mfcosta@fisica.uminho.pt

Abstract: *During the school year of 2008 – 2009 was organized the third edition of the science fair at Externato Maria Auxiliadora, in Viana do Castelo, Portugal. This fair involved students from the 5th grade to the 9th grade (ages between 10 and 15 years old).*

On previous years students had the opportunity to work, at school, with the responsible teachers during lunch time. On this edition, students had also the opportunity to work, in some occasions, in their projects in “Área de Projecto” and in the Science Club.

The effort of the science teachers that organized this event for the third time was reduced by the involvement of these non-disciplinary areas. This fact, associated to the experience that students acquire along this years, by participating or seeing the projects of others colleagues originate a science fair with good projects and the success was even larger. This event is already visited by family and friends of our students, but we hope that next year, this work will be presented to a larger community.

Keywords. Basic Schools, Informal learning, Science Fairs, Science project classes.

1. Introduction

During the XX century many changes were implemented on the curriculum of the Portuguese Schools to construct a better educational system [1] and decrease the school abandon. One of the last changes was the introduction of “Área de Projecto”, that started an experimental way in some schools in 1998 [2].

“Área de Projecto” is a curricular area, non disciplinary with a curriculum conception more flexible and autonomous to the school and teachers [1], and that works with an interdisciplinary method [2,3,4,5]. The curriculum of this area is discussed between teachers and students, taking in account the social and economic situation of the students, the reality that surrounded them [2,3,4] and the partnerships that they can form [1,4].

The major objective on this curricular area is the development of projects where the creativity, the investigation techniques, the text production and the scientific and social knowledge is stimulated. [1,2] All of this will contribute to a better school and, in the future, be responsible for helping the professional orientation of students [1,2,3,4], promoting their better comprehension of the world [1,3,4].

This curricular area should be promote a relation between school and general community, like the family but also companies and others institution. Students and teachers improve and develop not only scientific but also personal and social capabilities, since this is an opportunity for students meet and reflect about social, economic, technological, scientific, artistic, ... issues [3].

Teachers are responsible for the orientation of the project development but they also can ask for help to others teachers of the class [2,3].

The projects developed should respect a scientific method, promote the debate of ideas [2,3], based on experiments associated to systematic observation, formulation of hypothesis, testing them and finally the analyze, interpretation and explanation of facts and phenomenon of the real world [1,3]. Teachers from Área de Projecto should be responsible to give the opportunity of students to develop a project, therefore, they have to access to internet, movies, books, experimental and non experimental reports, videos...[3]

Science fairs are a way of students develops scientific projects to learn science and to learn of how we can make science. They involve actively the students during this learning process and results as scientific productions that can be expose to other people see and learn with them [6,7,8].

With this work we pretend to show how one extra curricular activity like a science fair, that students like and that can be developed with in this non-disciplinary area. Therefore, we have the opportunity to stimulate students to science without over charging of their free time.

It is relevant to inform that the steps presented here never limited students from working at home or in their spare time.

2. Development of the project

The realization of the 3rd edition of the science fair was announced to students and parents in the beginning of the year on the general meeting. However, during the first two school weeks we remembered/explained the rules and principles of the Science Fair with more detail and announced some important dates related with this event.

We explained to students that some hours from "Área de Proyecto" were available to them to develop their work. For the students that participate on Science Club it will be given opportunity to work there to. Otherwise, students could work at home and in case of doubts, they could talk with teachers from disciplinary areas at any time they needed.

It is important to say that the involvement from "Área de Proyecto" was not mandatory. The teachers evaluate the work developed by this students, but attributed other kind of projects for students that didn't wanted to participate in the science fair.

The major involvement from this non-curricular discipline was important for students because they didn't have so many necessities to work at their free time because they had the opportunity to research, planning, and experiment and make their conclusions during these classes. But it was also a big help to the science teachers that organize the science fair too because they have more time to plan the science fair and to analyze the students projects.

At the beginning of the year we explain to "Área de Proyecto" teachers when and what they should do to help the students with success. During the year we do some meetings to talk about with these teachers to arrange the better way to help the students. We explain that during first period students should be able to research from a theme they like and after select if they want to work in pairs or with friends with the same kind of project. They should help students to formulate a problem to solve and help them to research. During these classes students had access to internet and biblioteca and they were invited to discuss their ideas with other people from family, friends or professionals from that area of study. After students decided the work group and the theme, teachers help them to write a little report, with title, material and a brief explanation

about the theme they propose to study so, we can analyze and discuss with them.

The only problem was the fact that the "Área de Proyecto" teacher's weren't from sciences and can't help students directly with scientific doubts. But this problem were solve because students could use the hours of science club to discuss with the teachers from the scientific subject that they were working or they could talk with them and rescale to another hour.

After we analyze all projects we discuss with all groups to see that if they really know what they are doing or to help them in some aspects that weren't so good. Some projects were denied because the materials were dangerous or from difficult access or because they haven't no scientific proposal in that project. These students had the opportunity to reformulate the projects and many of them do it.

During the 2nd period students continued to develop the projects at school and at home. They continued to have the support in some hours of Area de Proyecto, where they have the opportunity to test their hypothesis and work at laboratory. When they needed scientific help, they talk with us again.

The evaluation of the students that participate at the Science Fair in Área de Proyecto was made according the general parameters already proposed to this subject at the school like:

- ✓ the participation and compromise on selection and development of the theme;
- ✓ Autonomy;
- ✓ Capabilities of working in pairs (on cases that this parameter applied);
- ✓ Capabilities to solve problems;
- ✓ Quality of the final product (this parameter was discuss between science teachers and the Area de Proyecto teachers);
- ✓ Presentation at the fair.

At the beginning of the 3rd period the fair were presented during the all afternoon and were open to all the school community and other people that want to see.

The evaluation of the projects was made tending in account some aspects like:

- ✓ The respect of all scientific phases, like research and planning of the theme, experimentation/testing the different hypotheses, make their conclusions and explanations;
- ✓ Explanation of their projects tending in account the scientific issues;

- ✓ Originality on choice of the theme and/or on the development of the project;
- ✓ Respect from the deadlines and of all stages;
- ✓ The presentation at the science fair.

Tending in account the number of participants was decided that would be selected the 3 better projects from 5th and 6th grades and the 3 better projects from 7th to 9th grades. This division was made by the ages and because of the differences of subjects that students had: for example, the youngest group didn't have physics or chemistry so, is normal that their explanations or utilization of the name of some concepts were a little more limited. To the others students that respect all the parameters announced was attributed an honors title.

3. Results and discussion

The science fair is organized at Externato Maria Auxiliadora since the lective year of 2006/2007 and analysing the evolution of the participation of the students it's possible to conclude that the number of participants it rising as it's possible to see on Figure 1. On first edition participate 42,9% of the students (this edition were only for students from 7th to 9th grades); on second edition participate 65,6% of the students and on third edition 77,9%.

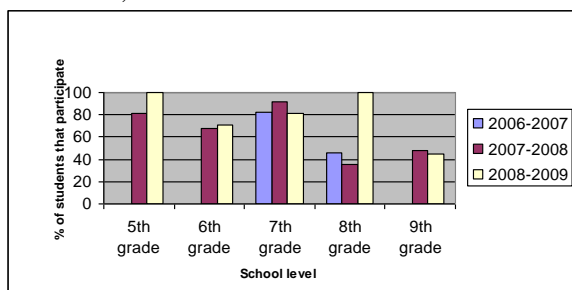


Figure 1 - Evolution of the participation of the students at the science fair

The major evolution verified this year was on 5th and 8th grades.

The participation of students from 9th grade is still limited. The bigger reason appointed from students is that they had much things to do to school because they had exams at the end of the year and didn't want to occupy the rest of the time with more activities to the school. However, with the biggest participation from the students from 8th grade and the introduction of this activity in Area de Projecto, we hope that this tendencies' of older students that didn't want to participate at the fair changes next year.

The biggest enthusiasm from the youngest was evident and make that they had great projects,

better than the oldest students that should have more knowledge.

Analysing the decisions from the jury, concludes that 71,8% (28 of 39 projects presented) of the projects presented at the fair respected all the parameters.

Along these years was possible to conclude that students prefer working in groups. However, the tendency of establish groups of four elements (number limit accepted) is being decreasing and the individually projects is increasing. Working in pairs is good if students have the same enjoyment for the project and share responsibilities during the development and the presentation of the project, and students are started to understand that. From this reason they started to select the theme and not the friendships, as we told to Área de Projecto teachers remember them during the research for a theme.

When we make the final analyze of the fair we conclude that this year we had what we call 4 non experimental projects. These projects didn't have with base experiences that permit to explain or test any factor. They simply explain how some things work. As an example we have the project of two students from the 7th grade that explain the clutch system, as is possible to see on Figure 2



Figure 2 - The peaces of the break system of a car Curiously, this kind of project made a great success between students.

4. Conclusions

This three years of organization of the science fair at Externato Maria Auxiliadora were very helpful for us (teachers) because we learn how to organized and planed all details for the science fair. The experience of working with this project in the same school, with some of the same students also allowed concluding that a great number of students already understand the meaning of the science fairs and how they should do to develop and present their project.

The fact of the science fair was announced to parents made that the number of visitants had being increasing and this become clear when we started a major involvement from parents and

friends during the development of the projects during this year. The opportunity of see the work that students made last year and the appeal to encourage and help them to participate made that parents and friends become an important help on this project. As an example, we have the first prize from a group of four students of 5th grade that explain how to work an telegraph, that we can see on Figure 3.



Figure 3 - Students explaining the Telegraph

Was curious to see that this four students of 5th grade made an complete study of the history and function of this instrument. Parents help them on the construction of the telegraph because was necessary use some materials that could be dangerous to them and explore with them the presentation.

The only problem that we appoint this year was the fact that the great number of projects (39) didn't allowed see all projects with calm, because the fair function only during the 14h00 to 17h00.

5. Future work

During the next school year of 2009/2010 we will continued to organize the forth edition of the fair. The projects will continued to be developed by the same way. We will continued to use "Área de Projecto" to work on the projects.

To help on the construction of the materials and posters, the teachers of Visual and Technologique Education (EVT) will included on the program of the discipline.

The fair will be presented during the third period but will be on a Saturday and during the all day on a place at the center of the city of Viana do Castelo. We expect that all this event make possible more people see the work of this young scientists.

6. References

- [1] Despacho n.º 19308/2008 (Princípios orientadores das Áreas Curriculares Não Disciplinares). Ministério da Educação. 21 de Julho de 2008.
- [2] Graça, E. Bibliotecas Escolares e Área de Projecto. Dissertação de Mestrado (2005), p. 107-151. Universidade do Minho, Braga, Portugal.

- [3] Orientações de Área de Projecto dos Cursos Científico-Humanísticos e Projecto Tecnológico dos Cursos Tecnológicos. Ministério da Educação. (2006).

- [4] Pacheco, J. Área de Projecto e/ou Projecto tecnológico no Ensino Secundário. Universidade do Minho.

- [5] Decreto-Lei 6/2001 de 18 de Janeiro. Ministério da Educação.

- [6] Esteves, Z. e Costa, M.F.M.. Science Fairs as an Annual Students Project. Proceedings of the 4th Internacional Conference on Hands On Science. 2007.

- [7] Z. Esteves, A. Cabral and M.F.M. Costa, "Informal Learning at School. Science Fairs in Basic Schools"; Proceedings of the 5th International Conference on Hands-on Science, 13-17 October; Espaço Ciência, Olinda-Recife, Brazil;

- [8] Zita Esteves, Andreia Cabral, Manuel F. M. Costa, "Informal Learning in Basic Schools. Science Fairs", Int. J. Hands-on Science; vol. 1, n.º. 2, pp. 23-27 (2008).