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New Air in Schools: The Impact of the PROFILES Project in Italy

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Abstract

For the prestige of the University it would be desirable to have students well motivated to reach the highest peaks of knowledge. On the contrary, many students arrive at University less and less prepared and motivated towards learning. This fact should require a profound change in the way of teaching, at all educational levels. The changes in the way of teaching, however, are long processes, which require a lot of effort and are not accepted by all teachers.

For Italy, it was a good opportunity to be part of the consortium of partner institutions of the European project PROFILES. In fact, the project's philosophy, along with other helpful ideas for meaningful learning, as the visible reasoning, improved the standard of teaching and learning processes in many Italian schools. Now many teachers have the awareness to make an impact in the vast majority of students and their teaching methods are appreciated by the managers and by the parents of their students.

Keywords: Continuous professional development; intrinsic and extrinsic motivation; the PROFILES project; visible learning.

Conference Topic. Effective Teaching Pedagogies

Introduction

The latest results reported in the PISA study (Program for International Student Assessment) are, unfortunately, not encouraging for Italy. In particular, with reference to scientific literacy, Italian students have a level lower than the OECD students average preparation, highlighting critical aspect in Italian education system. Students arrive at University less and less prepared and motivated towards learning. For example, a Friedel-Maloney (1995) questionnaire proposed during first lessons for students enrolled in the first year of an engineering university course typically leads to poor results: less than 50% correct on any question. (Cardellini, 2014)

Several causes can explain the unsatisfactory standard of schools in Italy. Perhaps the most important reason is the insufficient motivation of many teachers towards teaching. Scholars distinguish between intrinsic motivation and extrinsic motivation: “intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable” and “extrinsic motivation, which refers to doing something because it leads to a separable outcome.” (Ryan & Deci, 2000, p. 55)

In the case of teachers the key is the interest in the subject that they teach. Students have many interests: they use continuously computer devices and are attracted to new technologies. To capture their attention and engage them, teachers should transmit their enthusiasm for the subject that is taught. “The motivation of people surrounding us is thought to affect our own motivation through a process known as contagion (motivational and emotional). In school settings, contagion implies that the motivation displayed by teachers can affect student motivation, behavior and achievement.” (Moè, 2011, p. 368)

Talking about models, Henry Bent (1984, p. 777) concludes by saying that “*the most important models in teaching chemistry are chemistry teachers themselves.*” Teachers who do not believe in the importance of their work can be a barrier to pupils' learning. In an editorial eloquently entitled “Why Students Hate Chemistry” Tom Lippincott (1979) reports some statements made by a student: “As a student, I hated chemistry. ... The teacher ... appeared to dislike chemistry as much as he disliked the students.” The teacher

is the central actor in education and the quality of his work makes a difference. “Without excellent teachers Finland’s current international success would have been impossible.” (Sahlberg, 2010, p. 1)

A good teacher should take care of what is called the learning environment. A positive learning environment, “... engages students in some higher-order intellectual activity: encouraging them to compare, apply, evaluate, analyze, and synthesize, but never only to listen and remember.” (Bain, 2004, p. 102) In an environment where learning is actively supported, “The teachers were respectful, used humor, and where enthusiastic about learning. They also voiced expectations that all students would learn, and their procedures and management practices were based on respect.” (Patrick et al., 2003, p. 1533)

The European project PROFILES (www.profiles-project.eu) has been an important opportunity to rethink and encourage changes in ways of teaching that involved students making learning interesting. (Brianzoni & Cardellini, 2015) The acronym PROFILES stands for Professional Reflection Oriented Focus on Inquiry Learning and Education through Science and the name of a consortium consisting of teachers from 22 partner institutions in 21 different countries. It is a European project funded under the 7th Framework Program in the “Science in Society”. (Bolte, 2014) The project started in December 2010 and lasted four and a half years. In Italy, more than 1500 teachers from kindergartens to university know the existence of this project. The majority of teachers are of the Marche region with some schools teachers from five other regions. (Figure 1)



Figure 1. Distribution of schools where one or more teachers has been involved in the project.

The philosophy on which the PROFILES Project is based

A major concern in Europe is linked to the issue of poor students’ interest in careers related to science and technology: “Excellence in scientific and technological development is central to securing Europe’s future” (European Commission, 2004). Often science education is perceived as irrelevant, boring, abstract and difficult: “students have a perception of science education as irrelevant and difficult” (Rocard et al., 2007, p. 9). Glen Aikenhead brings a possible reason: “chemistry and physics are irrelevant and boring, mainly because their instruction is out of synchrony with the world outside of school” (Aikenhead, 2003, p. 103).

To motivate students to learning science, a European Commission report recommended that the inquiry-based science education methods (IBSE) are an important component to be included in educational practices (Rocard et al., 2007). The PROFILES project aims to make science education of the students in secondary schools more interesting and significant by promoting science education based on Inquiry. (Bolte et al.,

2011, 2012) The traditional way of teaching for many teachers is 'science through education', whereby only those aspects that are part of the syllabus are considered.

A more motivating approach seeks to actively engage students in activities related to the content of the teaching program: this alternative approach was referred to as the 'education through science' approach (Education as the learning focus, approached through Science as the vehicle). (Holbrook, 2010)

The overall project objectives are:

- to promote education through science;
- to support the professional development of teachers, improving their skills and encouraging their self-efficacy;
- to make the lessons of school subjects more interesting and engaging, promoting new teaching methodologies;
- to increase the intrinsic motivation of the students, making their learning more relevant;
- to create a network of contacts between the teachers involved in the project, both nationally and internationally.

These objectives are achieved by offering teachers a wide range of educational ideas, such as a context-based approach, the motivational student-centered learning, student engagement in the learning and teaching process (this aspect improves the cognitive conceptualization). It is also considered important the ability to communicate, to argue and student involvement in socio-scientific decision making. (Sadler, 2011)

Since the teacher is the most important factor that determines the improvement of standards in education, during the course of the project the greatest commitment has been the work for the continuous professional development of the teachers. This is a key component of the project, where "P stands for Professional. This refers to ways of enhancing the teacher as a professional in addressing the concerns and issues in science education." (Holbrook & Rannikmäe, 2014)

Long-term teacher professional development courses

The continuous professional development (CPD) of teachers, together with a kind of teaching oriented to the reflection, in essence, represents the focus of the PROFILES project. (Bolte et al., 2012) Three didactic methods have formed the backbone of the CPD in Italy: cooperative learning (Cardellini, & Felder, 1999), the use of summaries and concept mapping (Cardellini, 2004; Novak & Cardellini, 2004), and problem solving (Cardellini & Johnstone, 2005). The use of these methods was made even more productive by means of two teaching factors rarely used in Italy: the argumentation and the visible learning and reasoning. The teacher's sensitivity and his professional abilities make possible the use of visible reasoning in all circumstances, even in kindergartens. (Krechevsky et al., 2013)

More than 600 teachers from kindergartens to high schools know the aims of the project and its philosophy. Many of them have been involved in one or more meeting of the professional development program, but only a part of them completed it. Changing the way of teaching is a long and complex process: it requires commitment, study, and especially the capacity to question themselves and their own teaching.

The program changed over time requiring a smaller number of meetings: a couple of afternoon meetings in which the three methods were presented through lectures and workshops. All teachers received the material in order to be formed and to study the new methods. A feature of the CPD in Italy is that after the joint meetings, professional development has often focused on the solution of the difficulties that each teacher encountered when she or he tried to put into practice, for example, the cooperative learning method. This approach has been used in consideration that the learning needs are different for different teachers.

In this implementation cycles, an individualized strategy should be planned: "*Individual teachers will have different, and often multiple, learning needs, will be in different learning stages, at different points along the professional continuum, and this will be true at every points during the implementation of your plan.*"

(Loucks-Horsley et al., 2010, p. 164) The CPD was carried out mainly by face to face meetings: personal contacts were (and still are) also held by e-mail, phone, and social networks. The idea was to make sure that in every meeting there was some progress, through discussions and suggestions. Teachers of different subjects and coming from different schools were involved because the student training is an ongoing process, and for that the collaboration between teachers it is a very positive factor.

New effective teaching pedagogies

The desire to continuously adapt the teaching to the students in the class in order to increase what students learn in a meaningful way, led to new ways of teaching and new teaching approaches. They will be reported in brief some of the new teaching approaches developed by teachers using the philosophy of the PROFILES project and based on new teaching pedagogies. Narratives of these contextualized approaches can be found at the URL: <http://www.profiles.univpm.it/node/24>.

The middle school in Italy (Scuola Secondaria di primo grado) is considered by many to be the type of school with the largest number of unresolved problems. There are many reasons that may explain these difficulties: here we want to mention two. One reason is due to the lack of connection and collaboration among teachers in secondary schools with primary schools teachers. Another reason are the teachers' methods of teaching in the middle school that are totally different from those of primary schools. But there are good practices that are the meaningful exception.

The experience is situated in a class with some students with learning disabilities, and the math teacher teaches how to solve a problem in geometry. Students are already used to co-operate in teams of two. To each group is distributed an Italian dictionary and the following activities are performed: 1. The teacher dictates the text of the problem and asks students to write; 2. A student reads the problem aloud carefully; 3. The teacher slowly reads the text of the problem again; 4. Students identify (underline or circle) the words they do not understand; 5. The teacher asks the meaning of all words with mathematical meaning, even the simplest ones; 6. Each couple of pupils seeks the meaning of the words in the dictionary; 7. The class identifies the best definition; 8. In turn, the students explain the meaning of the word (in their own words); 9. Students translate into mathematical terms the meaning. (for example: the sum of two segments, $AB + CD$. The base is four times the height, $b = 4xh$); 10. Students rewrite the problem using simple words (in their own words): each student must write the problem.

This experience is given in the newsletter no. 7. In the same newsletter another remarkable experience of teaching and learning visible is reported. A module named "Kneaded, Cooked and Eaten" has been developed for a third class and in two fifth classes of a primary school. The two mathematics teachers have collaborated for a long time and share the same enthusiasm for engaging children in meaningful activities of active learning. Through the analysis of the food that children eat at breakfast, the math and problem solving are taught in a visible way. During the school year many topics have been introduced (such as multiplication, division, fractions, a bit of statistics, the concept of measure, equivalencies, etc.). In addition to this, many other activities to make children aware of what they eat. The children worked in cooperative groups made up of two to four members, depending on the work they did, with the assigned roles that rotated at every task. Each team did research on foods (carbohydrates, lipids, fats and salts, proteins). In order to make visible the reasoning, the children were trained to represent, to make the estimate of the results of operations and to the use of concept maps.



Figure 2. Children at the supermarket discuss the purchase of flour. A concept map. A fraction made visible, and a bag made for the sale of biscuits.

The project consisted in the study of the packaging, the sorting of the material for disposal, the analysis of the bar code, the search for the recipe, the informed purchase of food and work in the school kitchen to make



cookies. Then children calculated the cost of production of cookies, discussed the promotional campaign for the sale and made the packages. (Figure 2)

Many other activities have been developed as meaningful practices of this positive teaching pedagogy. A short list includes: Pythagoras: the strings of the lyre (Newsletter no. 8); Who wants to be a millionaire: a competition between groups to rehearse parts of the syllabus (Newsletter no. 11); A vertical science curriculum on the soil issue: a partnership between teachers involving children from kindergarten to middle school (Newsletter no. 12); The cooperative oral exam (Newsletter no. 12); Learning company: a learning by doing project (Newsletter no. 13).

Comments

Teachers of all classes and all subjects have been involved in the project. This in the belief that the education of students is a complex task that involves everyone. In the vertical science curriculum on the soil issue mentioned above, many teachers of different subjects, from kindergarten to middle school have been involved. This partnership has been very beneficial to student learning. Both because some of these teachers used the same teaching methods and all teachers share the same purpose, that because some boundaries between the teaching program have been overcome.

The science teachers should make learning more interesting and science more engaging, while teachers of humanities could involve students in constructive disputes, or other argumentative tasks in order to improve the ability to argue. (Osborne, 2010; Johnson, 2015) Teachers of different subjects can usefully collaborate.

In a third class of an Industrial Technical Institute, electronics specialist, the teachers of Italian, Automatic systems, and Technologies and Design of electrical and electronic systems have proposed to the students the same written examination, as reported in the Newsletter no. 14.

Teachers of biology and chemistry of two different high schools have developed a project called “Chemistry and Biology: ... What a Pizza!!!” to make their subjects more motivating. In Italian the phrase ‘What a Pizza’ has a double meaning: it is also referred to something very boring. The educational path has been very successful by involving students as well as teachers, as has been reported in Bianchini et al., 2016.

Conclusions

The implementation of the PROFILES project led to the development of innovative teaching practices, often unknown in Italy. These good practices resulted from the philosophy of the project associated with a pedagogy that places the emphasis on the aspects and positive elements in the class. This pedagogy share important principles with positive education, which aims to develop the positive human potential. These development programs of the students are commonly focus on: (Noble & McGrath, 2008, p. 120)

- promoting positive relationships with peers;
- emphasizing strengths;
- building competencies;
- providing opportunities to learn healthy behaviours.

As a continuous process, the formative assessment is used with the aim of improving student learning. Every effort is aimed at increasing student motivation, because students’ motivation plays an important role in learning strategies, critical thinking, problem solving, conceptual change and learning. Brophy (2004, p. 249) defined motivation to learn as “a student’s tendency to find academic activities meaningful and worthwhile and to try to get the intended learning benefits from them.”

Based on what is reported in this article, a lot of effort from the teachers is required: what motivates teachers? Teachers feel innovation as the fruit of their efforts: it belongs to them. As it has been stated, “One of the strongest conclusions to come out of decades of studies of the success and failure of a wide variety of curriculum innovations is that innovations succeed when teachers feel a sense of ownership of the innovation, or that it belongs to them and is not simply imposed on them.” (Ogborn, 2002, p. 143)

Another component may be the perception of self-efficacy, or the belief that you have the personal skills and resources to meet the needs of a specific task. The effective teachers are motivated, persistent, directed to a purpose, resilient and able to find sensible solutions even under pressure. “Teachers with a strong sense of efficacy are open to new ideas and more willing to experiment with new methods to better meet the needs of

their students ... they also tend to exhibit greater levels of planning and organization." (Tschannen-Moran et al., 1998, p. 223)

Brief biography of each author

Virginia Brianzoni is currently a high school teacher. She graduated “cum laude” in Environmental Engineering (Master Degree). She’s qualified for the practice of the activity of Professional Engineer in the Italian State. She achieved the PhD in “Materials, Water and Soil Engineering”. Between January 2012 and December 2015 she was Post-doctoral researcher at the Department of Materials, Environmental Sciences and Urban Planning (SIMAU) of the Polytechnic University of Marche. She was holder of a research grant on PROFILES project where she worked to achieve the objectives of the project, giving her contribution to improving scientific learning.

Liberato Cardellini is associate professor in chemistry at the Politecnica Università delle Marche, Ancona, Italy. He has about 180 research publications in science education, study of charge-transfer complexes and chemistry of free radicals. He has published interviews with prominent chemical educators in some scientific journals, including the Journal of Chemical Education. His research interests are in science education: problem solving, higher-order cognitive skills, and methods for improving learning as concept maps, active and cooperative learning. He currently is working on the motivations that make some students successful in creative problem solving.

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