



Environmental Projects to Motivate Science Learning in Primary Schools

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Abstract

Our paper briefs on project work activities that have been carried out with young learners in rural areas in Romania. Firstly, we point out that science education at primary level in Romania is based on a descriptive methodological approach. Students' exploration and inquiry are seldom a focus of the primary teachers. There is no hands-on methodology, not only because of the poorly equipped science laboratories, but mainly because most teachers have been trained to approach science teaching in a rather stick-to-the-book deductive perspective. Secondly, we present our attempt to help young learners connect scientific ideas to direct practical experience, focusing on environmental awareness. Our research presents a new perspective in the current practice. The project work we designed keeps a focus on nature exploration and the internalization of sound ecological attitudes on behalf of the young learners. Therefore, we promote an integrated approach through project activities, with a view to encouraging learning by discovering nature from a scientific point of view, and then by adopting the eco-friendly behaviour. Thirdly, we detail our findings. Our research was structured as a meta-project that comprised a variety of specific projects which were implemented in schools. The results comprise 10 projects, in which 153 children and 21 teachers from rural areas were involved in the academic year 2010-2011. The game-based, project-centered activities enhanced the young students' interest and motivation for learning science. Unexpected positive results included parents' involvement and entrepreneurial initiatives, which brought about important social benefits for the families and the rural communities. In conclusion, hands-on activities help students learn while having fun. They can thus explore and construct scientific concepts. Last but not least, they are likely to be more concerned about the environment, as 'understanding' is a shorter route to 'caring about'.

1. Science under the magnifying glass...

In Romania, the Science Curriculum for primary school was revised in several stages: the 1st and 2nd grade curriculum was revised in 2003, the 3rd and the 4th grade curriculum in 2004. The main goal of the new curricula has been to increase the compatibility between the scientific contents and the specific cognitive profile of the young learners. The suggested topics in the curriculum aim at stimulating the children's curiosity as the 1 to 4 graders ask many challenging questions and wish to understand processes and phenomena concerning their immediate environment. Despite the fact that the official documents recommend active learning approaches, through direct action and by valorizing the students' life experience, the classroom practice is quite different. Only a small number of primary teachers, most of whom teach in urban schools, engage their students in concrete exploring activities. In rural areas, teachers mostly work according to the old paradigm. They regard themselves as the experts who transmit the right knowledge to the students. The latter are supposed to absorb the concepts [1]. The teaching methods mainly focus on abstract notions, standard examples and how to obtain the correct result. There is no concern for a meaningful context that should challenge the young students' minds to start constructing the scientific concepts.



In rural areas, nature is much more present in the school environment than in towns and yet the teachers do not involve their students in outings and field inquiries. Why don't teachers organize observations in the school yard or trips in the nearby forest? Why don't teachers facilitate dialogues among students, with a view to explore their immediate environment? Why don't teachers support youngsters to discover the meanings of scientific phenomena?

Firstly, because the primary teachers and the curriculum developers belong to two distinct communities who are unfortunately separated by a large gap. The specialists who developed the curriculum aim to implement a new perspective in the Romanian education system, one which is sustained by new theories of learning and a student-centered approach. On the other hand, teachers are unsatisfied with changes they cannot understand, due to their lack of quality training. The rural areas in Romania face a general crisis of well-trained teachers. Because of unmotivating salaries, very few new graduates choose to remain in the education system and even fewer come to teach in a rural area. That is why, those who currently teach in village schools approach science in a stick-to-the-book deductive perspective.

Secondly, the above mentioned incompatibility can also be explained by the low financial investments directed to educational resources necessary in experiments and hands-on activities. Nevertheless, poorly-equipped laboratories are not a problem so difficult to overcome, if teachers had the ability to identify and make use of outdoors resources, or if they were open to making simple, unsophisticated experiments, by means of familiar everyday objects. Basically, human resources represent the major problem and not the material equipment [5].

2. Pathway from nature exploration to environmental awareness

The traditional teaching we mentioned above is inadequate to our modern world. Children nowadays cannot become socially-active citizens if they do not learn actively and do not transfer into practice what they learn. They will not be able to use scientific thinking in order to solve everyday problems, as long as they are not motivated to observe, ask questions, look for answers and check them. Furthermore, they will not be able to take responsibility for the effects of their actions on the environment, as long as they are not familiar with establishing cause and effect relationships.

Metaphorically speaking, the voyage from nature exploration to science learning and environmental awareness is like hiking on a virgin mountain. You start to climb, explore, sweat, discover, choose a path and get stuck, come back, explore some more and finally reach the top. From up there you contemplate the entire route and you see it differently. You are very fond of this path because it is your path and you have worked hard for it. And you would like to help others to come up and have a different look as well. With such picture in mind we initiated a research project the aim of which is to support primary teachers in rural areas to discover new ideas for science teaching, i.e. to make a better use of that time when children are curious and highly creative and to gradually change their mindsets' focus from what is learned to why something is learned.

The project work we designed targets nature exploration and the internalization of sound ecological attitudes on behalf of the young learners. Our intention has been to promote an integrated and experiential approach, with a double perspective. On the one hand, exploring nature from a scientific point of view facilitates learning in geography, physics, chemistry, geology altogether by investigating how such issues interact and influence people. On the other hand, studying the environment in a friendly way, by observing how people influence nature through their actions, helps students develop a greater sense of responsibility and concern for the future.

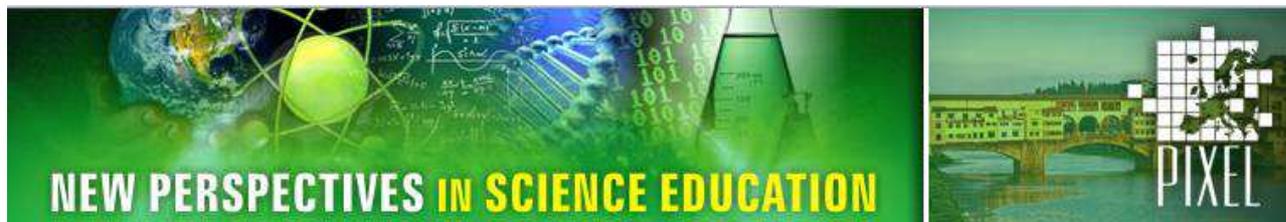
The choice of project work as a vehicle to implement change is motivated by a number of reasons. Projects are part of our daily life and they are omnipresent at the workplace, in the community [2]. They are also useful tools in a dynamic society and they require a wide range of abilities which need



to be developed in school if later on we want to be successful in life [3, 4, 5]. The experiential, hands-on component of the project is meaningful if science learning and environmental awareness are to become meaningful for students. In our view deep understanding of science cannot occur in the old fashioned way, i.e. by listening to the teacher or reading from the book and then reciting some generalizations. This pattern leads to superficial scientific knowledge. In our approach we help teachers to challenge their students to face the reality outside the classroom and to observe natural phenomena and processes. In this perspective, students learn by doing and experience. Learning becomes not only fun but also meaningful since the children start to grasp the reality around and relate to it.

3. Results that make a difference

Our project involved 21 volunteer primary teachers and 153 young students from rural communities in one county in 2010-2011. We started by developing a Resource Centre in Potlogi School (Dambovită County), with the help of parents, local community members, volunteers and the OvidiuRom NGO education specialists. The centre has been organized as a space for research and experiments that stimulate curiosity, play and fun. It is a multifunction, aesthetical environment which is equipped with a library, computers, TV and other audio-video devices. The 21 teachers were trained in this friendly setting for one month throughout the summer of 2010. During the workshops, the teachers faced real experimental situations, they made field trips and explorations and practiced modern teaching techniques. The teachers were challenged to identify their needs and then supported to design their own projects to apply in classroom practice. They worked individually or in teams and they came out with the topics we synthesize in Table 1. All the projects have been designed in an integrated approach, focused a variety of science/ environmental issues as well as useful outcomes.



Project title	Science/Environmental issues	Outcome
<i>Who am I?</i>	-favorite animal -favorite flower	decorate the classroom with the artifacts resulting from the activities that facilitate a better understanding of who the students are
<i>Gifts for Saint Nicholas</i>	-magnets properties -recycled materials - cardboard -materials from nature: pebbles, seeds, shells	exhibition in order to sell magnets to raise money for a trip
<i>Christmas Gifts</i>	-recycled materials - paper, thread, plastic bottles	exhibition in order to sell decorations and greeting cards to raise money for educational science games and kits
<i>A Slightly Different Christmas (2 projects on the same topic)</i>	-recycled materials - plastic bottles, cardboard -wire properties (see Fig.1)	objects specific for the winter season that are made of recycled materials
<i>Puppets</i>	-ocean ecosystem	Puppet show with the story <i>The Rainbow Fish</i>
<i>Angels</i>	-materials from nature: seeds, leaves, pebbles, sticks	Christmas festival
<i>The Joy of Spring (3 projects on the same topic)</i>	-materials from nature -pebbles, seeds, shells (see Fig. 2)	Greeting cards and decorations for the 8 th of March

Table 1. Projects involving 153 young students in hands-on meaningful activities

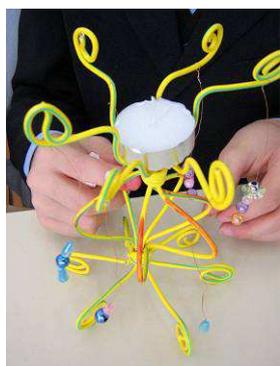


Fig. 1. Making decorations out of wire, while learning its properties



Fig. 2. A gift for the 8th of March, made of shells and other discarded materials

All projects involved the students in meaningful activities with a clear outcome for their own understanding: whether the project targeted a festival, an exhibition, a fair, a classroom display or a show, the students understood from the very beginning that what they do has purpose. Some projects started with nature observation – in the school yard or at home – and the collection of elements that can become nice and cheap materials for pretty decorations. Other projects involved recycling waste. Others involved more reflection and transfer for the scientific concepts and phenomena. The ‘Gifts for Saint Nicholas’ Project, for instance, challenged the students to decorate fridge magnets (Fig.3.); within the process they observed and learned about the magnets properties. In the ‘Puppets’ Project,



while preparing the role play for the “Rainbow Fish” story by Marcus Pfister, the children explored the marine ecosystems. They studied sea species and then chose their favorite character, developed the setting and produced their ‘stick puppets’ (Fig.4.).



Fig. 3. Fridge magnets made by students while learning about magnets properties



Fig. 4. Studying marine creatures and making ‘stick puppets’

An interesting example of hands-on eco activity was included in ‘A Slightly Different Christmas’: 4 grade students learned to re-use household waste and consequently develop an environmental awareness (by discerning the types of waste and the daily amounts produced at home and at school), creativity and entrepreneurship (by transforming discarded objects into something useful, that can also be sold), as well as a sense of initiative (by understanding that their attitude can bring positive changes). Such an activity broadens the students’ perspectives and, what is most important, they learn with purpose and without effort. In addition, using waste as a teaching resource is cheap and a good solution to the lack of educational materials. Some products have been used in integrated activities (such as arts and crafts, languages, math). Others have been sold in the Christmas fair organised in the community and helped in developing social skills and passing a positive message in the village (Fig.5.).



Fig. 5. Students selling some of their products at the Christmas Fair

4. Conclusions

Throughout the project, the participants understood that a teacher’s purpose is not to simply communicate information, but to offer guidance in students’ work by facilitating exploration and personal experience. Moreover, teachers have become more aware that the only route to genuine learning is the use of active methodology and that students need to be listened to while they verbalize their own results interpretation. If students are to care about the environment they need to observe how this ‘works’. Patience, cooperation and tenacity are also important ingredients in a contextualized



approach to science learning. Hands-on activities help students learn while having fun. Students have discovered that Science is an attractive subject. They had the opportunity of working together in an interactive context, where they investigated, communicated their results and constructed scientific concepts. In this approach students could follow the cognitive pathway the scientists developed when they made research and arrived to the findings that are presented in the science school-book.

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