

Innovation in Education: Transforming a School into Sustainable, through the design and implementation of an innovative program in three areas of action

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Abstract: This paper presents in detail the introduction of sustainability in our Kindergarten. The innovation of the project lies in the fact that the students are not just recipients of the various issues, situations, problems of the school but they themselves act and set their group identity and conscience for a better, innovative, sustainable school. The essence of the program was the involvement of students in sustainable development, through their student life. Our goal was to create a sustainable school, a social, innovative school in practice, a school open to society, as children dream, and teachers want it. During the program many activities were carried out that fall into all the pillars of sustainability. We evaluated and disseminated the program to the community, gaining benefits for students, teachers, the school, and the local community.

Keywords: Innovation in Education, sustainable school, innovation design, innovative school, sustainability indicators

1. Introduction

The needs of the modern school create the conditions for the implementation of innovative programs which will be able to effectively meet the learning objectives, to contribute to the smooth socialization of students and to the formation of their social consciousness. In recent years in Greece, the state has been trying to fill the gap of the introduction of innovations, in contrast to other European countries that have successfully implemented innovation in their education system for years (Giannakaki, 2005).

2. Theoretical approach

2.1 The term Innovation in Education

The term Innovation was first used in economics, denoting the existence and application of new ideas in economic activity. It was then used by almost all industries stating the meaning of change and justifying any changes that occurred in social, economic, or organizational level. That is why there are so many definitions in the international literature on the concept of innovation.

A definition that is presented as more complete, defines innovation (Rekleitis 2002) "as an unusual, important and discontinuous organizational change that includes a new idea, which does not agree with the existing general idea of the organization and implies organizational intelligence, because it is followed from changes in current organizational skills, current cognitive patterns, conceptual models and applied theories".

According to Papakonstantinou (2014) innovation is considered the strategy of one or more bodies in the direction or challenge of change.

According to Russel & Russel (1992, op. Cit. In Iordanidis, 2006: 10) school innovation in particular, is defined as "the decision-making process of the members of the organization in which these members are committed to a process, an organization, a product, a program that is new to the organization".

School innovation is inventive educational changes with an original and inventive character, aimed at optimizing the quality of teaching (Asimakopoulos, 2018).

In the relevant literature, the terms "change" and "reform" are clearly separated from the term "innovation" since these terms are not identical in content or size. However, literature research has shown that they are inextricably linked. After all, a change that occurs in a school unit can easily be transformed into an innovative action if it is connected with the solution of specific problems, needs and goals of the specific school. The importance of the existence of innovation lies in the fact that it is a basic condition for the response of the school organization to the social needs and environmental changes as well as to the demands of the students. Increased competition and the need for differentiation, lead to the need for innovation, which improves students' academic performance, promotes their creativity, and motivates them to learn (Beladakis, 2007).

The introduction of an innovation in the educational system, refers to the adoption and implementation of initiatives to express the educational change that is mainly related to the educational unit and the teacher of the practice which of course is not applied as enforcement (Siakovelis, 2011).

In addition, in Hoch's article (2013) we read that innovation in a school unit is difficult to introduce, because it affects the ability of teachers to adapt to change and the ability to remain competitive in this change of environment. The school leadership also plays a catalytic role here in facilitating the ability of members to adapt to change and to link innovation with school practices.

2.2. The Sustainable School

The main idea for a sustainable school is to integrate sustainability into every aspect of school life (in administration, building management, learning-teaching process, commuting to and from school, school-to-school community relations, and ecological footprint) (Kalaitzidis, 2013)

The purpose of the sustainable school is for the children to understand the dimensions of sustainability and to become aware of environmental issues, but mainly to change the school itself so that it becomes a model for its students and the wider community, an organization that adopts sustainability in his daily practices and promotes it in all its forms. In other words, it applies the principles of sustainability in all three areas of its operation (pedagogical, social - organizational and environmental-economic) (AliKhan, 1996; Posch, 1998; Flogaiti & Daskolia, 2004). Specifically, the pedagogical sector concerns the curricula and the teaching process, the socio-organizational sector concerns the educational policy and the relations within the social context and the environmental-technical-economic sector concerns the environmental footprint, infrastructure, and equipment (Kalaitzidis, 2013).

In a Sustainable School, its structure and organization, ie all its structural and organizational elements (buildings and human resources), its functions (from the operation of the radiator to the teaching-learning process) and its relations (relations between teachers and students, relationships between school and local community, etc.) are designed and exist to ensure the well-being of education and the local community. In other words, it is a school that is based on communication and cooperation between all members of the school community and operates to serve the culture, the environment, the economy of natural resources and the well-being of the individual. Teamwork, flexibility, creativity, self-organization, critical thinking, systemic consideration, participation in the decision-making process and taking action, are key points on which the operation of such a school is based (<http://www.aeiforum.eu/index.php/el/>).

The School as Sustainable promotes democracy and human rights, cultivates a team spirit, promotes collaborative processes, provides opportunities for everyone to engage with the public and manage them. In addition, it shapes active and creative citizens through experiential learning methods that activate them in the acquisition of knowledge. It enables everyone to care and intervene actively in their space, shaping the pedagogical criteria themselves. Consequently, Sustainable Schools function as living learning communities, through participatory processes of all their involved members: the management, the teachers, the students, the parents, the local community.

Thus, the Sustainable School lays its foundations in Education for Sustainable Development, promotes Health, Culture and Environmental protection, using the School Activities Programs as a springboard, to go beyond them in a holistic approach to its actions (Kalaitzidis, 2013).

3. Description of Innovation

This innovation covers recognized and existing needs of students and teachers. Amid the rapid political, economic, and social developments that are taking place at the international level, the traditional school is obliged to change its form and follow the new rhythms. It is gradually becoming more modern, flexible, and attractive, with the utilization of Technology being at the top of the learning process.

Our Kindergarten is located in a relatively degraded area on the outskirts of the city and until recently, it was an unknown, abandoned school, with teachers who did not choose it for an organic position, with parents who did not know or did not care about the work done there and with zero cooperation with Agencies and local actors. Environmental education programs were not implemented by any department and the students had never heard the word "environment" before. These problems were the special challenge to deal with the awareness of students and the region in general and the transformation of the school into a sustainable one.

Our vision was to create young, active citizens, who through actions and activities of environmental and non-education, will actively deal with issues of Sustainable Development, will gain environmental awareness and skills capable of helping them as adults to become responsible, Active Citizens. Our concern was also to make the school a pole of environmental awareness and information of the local community.

3.1. The idea-the need

The main idea of the program was the integration of values and the idea of sustainability in all aspects of school life, from administration and the learning process, to building management, commuting to and from school, school relationships with the school and the wider local community.

The characteristics of the Sustainable School can be classified into three interrelated and interdependent areas:

The Pedagogical, the Social- organizational and the Environmental.

The Sustainable School has clearly rejected teacher- centrism definitively. He has introduced the student-centered teaching method, enriched with other active teaching approaches (role-plays, dramatizations, simulations, etc.). Its key element is the active participation of the student and the change of the role of the teacher, from a transmitter of knowledge to a coordinator of the process for the discovery of knowledge. Another key feature of the Sustainable School is the introduction of technological innovations in the learning process.

The adoption of the collaborative teaching method even determines the arrangement of the desks and the positions of the students in the classroom, while this arrangement contributes to the change and improvement of the relations between the children, that is, it contributes to the overall improvement of the classroom climate. school climate. Participatory and student- centered teaching approaches develop students' skills and abilities for critical thinking, for understanding other cultures, for accepting the different, for a desire to participate in the community and for the development of a democratic consciousness.

Today's students are trapped in an educational system that causes them stress, fatigue and indifference. They have lost their mood for learning and their fun for school activities.

In addition, one of the needs of the modern school is the continuous training of its teachers based on the new data. In our program, all those involved in school life, will have the opportunity of continuous training and self -training, through online seminars, but also through mutual monitoring of the teachings of other colleagues. In addition, the hidden curriculum, and the invisible relationships between the school actors, make the school more productive, the image of the school more attractive, the teachers feel better with each other, the relationships between all the actors are more authentic. Aspects of this hidden curriculum are the optional school activities and their products, the reduction of the need for punishment, the reduction of incidents of violence at school, the desire of teachers to participate in educational visits, the improvement of school hygiene, etc.

Besides, 30-40% of our country's energy is consumed by buildings. School buildings in particular are very expensive in terms of heating because almost none were built with the principles of ecological construction. They also consume significant amounts of oil, electricity, water, paper and produce a lot of waste. A negligible percentage of the paper consumed ends up in recycling, resulting in the waste of trees and natural resources. Thus, schools are organizations that contribute to the greenhouse effect and the burden on the planet. That is why it is necessary to change the energy consumption of schools, and this is another goal of sustainability.

The socio-organizational area of the program includes leadership, the school's relationship with parents, the local community and agencies, teacher-student relationships, teacher-to-student, and student-to-student relationships. Each factor of the educational process has its own important role in this innovation.

The school principal should act as a leader. He is the one who has the vision, which he will pass on to the other teachers, students, and parents. He must plan and implement with sustainability in mind. It must adopt the democratic and participatory decision-making process, where everyone participates and has a say. Decisions will be taken by all parties involved, through discussion, voting, consultation, democratic and transparent procedures.

The leadership should create the right atmosphere of cooperation so that the whole school produces its own improvement plans and implements these plans with the participation of all (students, parents, associates).

Students talk about many important issues in school life. All children participate in discussions that concern them, voting, giving their opinion and learning the democratic ways of consultation.

Parents are actively involved in school life, supporting the school in various ways, without, of course, hindering its operation and without trying to replace the school's governing bodies. Collaboration with students' families, the school community, the local community, and social agencies plays an important role in the Plan.

The local government also has an important role in school life, through quarterly grants, the repair and improvement of school buildings, the support of school activities, the utilization of school programs, etc.

But the most important thing is the democratic operation of the Teachers' Association, whose decisions determine the essence of school life. The guarantee of a sustainable school is this democratic and pedagogical function of teachers. The role of teachers changes and from simple transponders of knowledge, they become companions of students and parents in the acquisition of knowledge. The climate inside and outside the classroom, the relations between them and the relations with the students and the parents, the type and the way of imposing the punishments, the acquaintance with the school programs, the opening of the school to the society etc. are issues that concern the teachers' association and that is why its role is so crucial. It should be a source of inspiration and to achieve this, it is necessary to provide it with a free, creative environment, an incubator of new approaches and ideas.

The program was easily integrated into the curriculum with a cross-curricular approach in all learning areas of the Curriculum. The children had the opportunity to expand their personal and social development through communication with each other as well as through their participation in collaborative activities.

Moreover, one of the key elements of modern education is the development of citizens with active participation in environmental events and awareness of the environment and sustainability. Students' skills and abilities are improved, they learn through experiential ways of approaching knowledge and they act for a better world that concerns them all. The ability to think critically, to gather information from multiple sources, to evaluate sources, to know how to learn, is one of the basic elements that a student must acquire through school, according to the principles of modern education. This innovative program, enriching the Curriculum and contributing to the development of teaching objectives is moving in this direction.

3.2. Expected results

The implementation of this action, as a deliberate and systematic intervention, we believed would bring many important benefits to the entire school community.

Students will have the opportunity: to participate actively in issues that concern them and to become responsible, active citizens, with great confidence since in fact they undertake their own learning. To become aware of environmental issues through an attractive way of learning and to produce digital products of their own work, using the internet and web 2.0 tools.

Teachers will have the opportunity to collaborate and contribute to building active, democratic, responsible citizens, to learn new teaching methods and to become involved in knowledge, creating a framework for approaching concepts and practices that are environmentally friendly and sustainable.

Parents become learning companions, enter the school, collaborate, help and understand what exactly is going on there.

It is a program that triggers all stakeholders, who are called to adopt attitudes and characteristics of a member of a sustainable community, through an attractive and innovative approach.

In conclusion, we would say that the introduction of such an innovative program, we expect to bring about changes both at the individual (students, teachers, parents) and at the group level (school and local community). In general, the influence of the school is not limited to the narrow context of the school itself, but also extends to the wider social environment, ie it affects an important part of society.

3.3. Selection Criteria

In order for an innovation to be implemented, it must be possible to implement it. According to Fullan (2007), there are four criteria for the success of an innovation in educational organizations

1. The change must meet a specific and existing need of teachers and students in the educational process, so that there is strong and undiminished interest from those involved.
2. The requirements of innovation from the stakeholders should be clear, ie the role of everyone should be defined.
3. The change should positively affect the lives of those involved (students - teachers) and give feelings of satisfaction and adequacy to all
4. There should be mobilization and cooperation - interaction of all participants.

In order for an educational innovation to succeed, it is necessary to have:

- Commitment from stakeholders to support innovation and strive to integrate new members.
- Innovation to reflect the expectations of all involved and to provide opportunities for the use of all forces.
- The leader-manager should actively support innovation and cultivate a safe environment for all involved (Giannakaki , 2002).

Of course, there are criteria that determine the degree of sustainability in a school, ie **indicators** that indicate the success of a sustainable policy. The indicators can be qualitative or quantitative and should cover all three areas of sustainability.

So, in terms of the pedagogical sector, there are three indicators that we focused on:

- How many educational visits were made during the school year?
- How many in- school teacher training activities were organized in the school itself.
- How many events took place at the school with the cooperation of parents and Institutions and with an audience of parents and the local community.

Regarding the socio- organizational sector, we also have three metrics:

- Percentage of teachers who actively participate in the creation of the Sustainable Management Plan and the School Action Program.
- Social activities carried out by the school community inside and outside the school.
- Collaborations of the school with scientists, artists, NGOs and other local, national, or international

bodies.

Finally, the indicators with which we measured the successful development in the environmental sector, are:

- Materials given for recycling per student and teacher expressed in appropriate units of volume (weight, volume, pieces).
- Existence of a school garden
- Certificate of annual maintenance of the radiator
- Percentage reduction of the annual consumption of photocopy sheets per student and teacher.

The **target values** of these indicators differ depending on the stage we are at. Analytically, our goal was in the first year of implementation of the project, to make 5 visits and in the second year to exhaust the margins given to us by the Law, ie to reach 9 visits. To carry out 3 in- school training activities in the 1st year and in the 2nd^{year}, 6. Finally, to implement 3 events with an audience in the 1st^{year} and 7 events in the 2nd^{year}.

Social sector: Our goal for the first index was, in the first year to actively participate 3 teachers and in the 2nd^{year} all the teachers of the kindergarten, ie 6 teachers. For the second indicator, we aimed to carry out 5 social actions in the 1st^{year} and 10 in the second. For the third indicator, to have cooperation with 20 Bodies in the 1st^{year} and with 40 Bodies in the 2nd^{year}.

Environmental sector: In the 1st^{year} to be given for recycling 5 kg of materials per student and teacher and in the 2nd^{year}, 10 kg. To operate a school garden from the 1st^{year} and to create a greenhouse on the 2nd^{year}. The radiator boiler should be maintained every year. To reduce in the 1st^{year} the use of photocopy paper by 10% per student and teacher and in the 2nd^{year} to reduce by 30%.

3.4. Implementation Steps

In every change / innovation there is always the risk of failure at every stage, from the adoption to the establishment of the innovation. Therefore, all factors that cancel the effort should be treated satisfactorily at all times.

According to Fullan (2007) the process of change consists of three phases: the **introduction of innovation, implementation, internalization**. The design provided for the existence of an appropriate information system, finding resources, informing, and preparing teachers, students, and parents. The timeline was necessary to check if the expected goals were achieved and to follow up on feedback and rescheduling.

Initially, all those involved had to decide to support the change and commit to its implementation, after recognizing and recording the current state of the school (weaknesses and strengths). Define the individual objectives, indicators and target values, the action plan, the division into groups and the description of the individual actions to meet the objectives.

During the implementation phase of the change, all actions had to be implemented, measurements made, the progress and progress of each project-action monitored, and the evaluation-feedback done in order to check the degree of satisfaction of the objectives but also to be adjusted. actions to improve our indicators. Also, to disseminate the results to the local and not only the community and events promoting the project.

Finally in the internalization phase, innovation was not considered something new in the school unit but has been established by all as a way of operating the school.

Responsible for monitoring the progress of actions and actions and to support and mobilize, it was decided to be the support team, consisting of students and a teacher-coordinator. The support team was the one who would ensure that everyone fulfills their duties successfully.

Regarding the schedule, the program was implemented over a period of two years with specific milestones as follows:

Each indicator directly or indirectly included a time dimension. Some indicators required frequent measurements, others monthly and others at different intervals. The duration of the measurement periods was from October to May each year. Based on this time period, all the plans of the year had to be made, the appropriate measurements had to be made and the school had to create the appropriate forms for the recording of the measurements.

It included the following landmarks per year:

- 1. Defining the individual goals that had to be achieved**
- 2. Dividing students into activity groups and appointing their coordinators**
- 3. Detailed description of the individual actions (grouping of indicators)**
- 4. Formulation of the schedule of actions-actions**
- 5. Distribution of responsibilities to the project implementation teams**
- 6. Finding partners**

7. **Monitoring the progress of each action**
8. **Evaluation-feedback of the achievements based on the pre-defined objectives, actions for the improvement of the indicators**
9. **Promotion events and publication of the results**

The table below shows the objectives, indicators, and measurement values of the indicators, as well as indicative actions that had to be taken to achieve the objectives. In between, of course, actions were taken to monitor the intermediate values of evolution of the phenomenon. The third year aimed to make innovation permanent in the school.

Table 1. Innovation-Learning

STRATEGIC GOALS	INDICATORS OF INNOVATION PROGRESS / SUCCESS MEASUREMENT	OBJECTIVE VALUES OF MEASUREMENT INDICATORS	ACTIONS TO ACHIEVE THE GOALS
Pedagogical field	How many educational visits were made during the school year?	5 / year (1st year) 10 / year (2nd year)	Visits to Museums, Environmental Education Institutions, Libraries, Theaters, Local Institutions
	How many in-school teacher training activities were organized in the school itself.	3 actions in the 1st year 6 actions in the 2nd year	Speech event with child psychologist, event about digital security, event about first aid.
5/3	How many events took place at the school with the cooperation of parents and Institutions and with an audience of parents and the local community.	3 events in the 1st year 7 events in the 2nd year	Creating a “trash art” exhibition with the participation of parents, Theatrical and games at the end of the year with the participation of parents, creation of an open-air library in the yard.
Social-organizational sector	Percentage of teachers who actively participate in the creation of the Sustainable Management Plan and the School Action Program.	Participation of 3 educators (1st year) Participation of 6 educators (2nd year)	The aim is for a satisfactory number of teachers to participate in the first year and for the entire teaching staff in the second year.
	Social activities carried out by the school community inside and outside the school.	5 actions (1st year) 10 actions (2nd year)	Collect food for needy families, collect toys for the Ark of the World, raise money for UNICEF, participate in Action Aid programs
	Collaborations of the school with scientists, experts, artists, Non-Governmental Organizations and other local, national or international bodies.	10 Institutions (1st year) 20 Institutions (2nd year)	Lake Management Agency, Forest Office, City Hall, Green Service of the Municipality, Environmental Group of Ioannina, Paguristas, Let’s Do It Greece, Eco Schools...
Environmental Sector	Materials given for recycling per student and teacher expressed in appropriate units of volume (weight, volume, pieces).	5kg / student (1st year) 10 kg / student (2nd year)	Recycling of paper, batteries, plastic lids, composting
	Recycling of paper, batteries, plastic lids, composting	Creation of a school garden (1st year) Greenhousecreation (2nd year)	School garden, vegetable garden, herb garden, greenhouse

	Percentage reduction of the annual consumption of photocopy sheets per student and teacher.	10% reduction per student (1st year) 30% reduction per student (2nd year)	Less use of photocopies and worksheets and more evaluation through experiential actions
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4. Evaluation

Evaluation of the introduction of innovation was done at all stages. Evaluation indicators were the effectiveness of the objectives of the introduction of the innovation, the reliability, the security, the usability of the application. All the above indicators were constantly evaluated through observation, interviews, and questionnaires, where the degree of satisfaction was measured (too much, too little, not at all).

So, there was an initial, intermediate, and final evaluation and analysis and feedback was done at all times.

At the end of each school year, each group had to present to the whole school its action (planning, implementation, actions-actions, evaluation of results) and an assessment of the positive and negative experiences gained by its members. The presentation was made with the SWOT analysis (strengths, weaknesses, opportunities, threats).

Everything that the school gained from the effort to turn towards sustainability, was presented at the end of the two years throughout the school and local community, in a big event-celebration, which was attended by all those who contributed to it: students, teachers, parents, Institutions, NGOs, etc. At this celebration, the final evaluation was made, feelings and thoughts were expressed about participating in such an innovation, they congratulated each other and the achievements of all were presented.

5. Conclusions

Based on the Theory of Activity and the belief that learning is the result of interaction, the aim was to "open" the school to the wider community and to extend the learning environment outside the classroom, by applying the formal, non-formal and non-formal teaching, according to which the natural, social and cultural environment was utilized as a primary source of knowledge.

During the design and implementation phase of the educational intervention, action research and field research were applied, while the socio-cultural approach of science teaching, new technologies / educational robotics, engineering, arts, and mathematics were used as methodological tools.

In the empirical part, a brainstorming session took place and through democratic processes proposed activities related to the topic were submitted by the students themselves, the teachers and in some cases by the parents. This was followed by the conceptual mapping of the subject using the Kidspiration software, in which the speech and the image coexist, a fact that facilitates the students' first reading stage. This open-source software was enriched during the formative evaluation and was additionally used in the final evaluation of the knowledge and skills acquired by the students during the implementation of the action.

The project was implemented in our Kindergarten for two consecutive years and the benefits were above and beyond our expectations. Our students for the first time in school participated in a similar program, took an active part in the sustainable team of the school community, worked in groups, found information, developed their imagination through construction and discussion, made new friends from distant schools with a different way. As creators and stakeholders, they participated in collaborative and experiential activities, recorded suggestions, suggested solutions, came in contact with nature, took an interest in the environment, cleaned it, were inspired by it and painted it, cared for their own school, felt a strong team, were interested in the supply of materials (paper, ink) in waste reduction, in the recycling of materials, in the composting of organic waste, etc. (G. Fermeli, E. Fuseki, 2014). The consequence of all the above was the reduction of the ecological footprint of the school.

Thus, the students became constructors and co-creators of knowledge, which boosted their self-confidence and autonomy throughout the program.

The teachers, we worked in the context of the virtual interactive classroom, we shared our ideas, our goals, and our lesson, we collaborated with other colleagues from our school to carry out actions for a green and sustainable school. All this helped us to improve our teaching methods, to go beyond the closed limits of the classroom and to work with parents and Institutions, boosting the reputation of the school and earning respect for it.

The main destabilizing factors in the implementation of our innovation were many with the most important being the resistance of some teachers to change and the commitment to the current situation and the safety of the routine. Also, the lack of information and training on the new data in education but also the risk of failure led to negativity on the part of some teachers. Some other factors can be considered as the lack of time but also the workload, as well as the resistance to the imposition of changes from outside.

The result of the action and the final reward of all involved was the awarding of our school with the Certification and the Flag of the Sustainable School as well as with the Green Flag of Eco Schools.

The active participation of students, teachers, and the wider community, as well as the rich material produced, confirm the effectiveness of the project in terms of the sustainability of our school.

Specifically, it was observed that in the context of understanding and disseminating the goals of sustainable education, active citizenship, feelings of solidarity and responsibility were cultivated in both students and teachers and in the wider environment.

We support the utilization of the conclusions of the implemented educational intervention to students at older school age, after the appropriate adjustment of the action plan, based on their curricula.

In addition, we point out the need for training of teachers and future teachers on issues related to sustainable education, but also their inclusion in the curriculum.

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