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A Design Tool of Didactic Scenarios for Science Teaching in Secondary Education

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Abstract
Modern learning environments must be properly designed to facilitate active and collaborative learning processes, to help students understand and not only to memorize, to promote changes in their ideas, to bridge the gap between the activities that take place at school and those at home, in society. Teachers, as facilitators of introducing the new knowledge, need more comprehensive teachings to stimulate the interest of students and inspire them to seek the scientific spirit in the wisdom of previous generations and to search for the scientific truth when studying the natural world. In this paper described the design, a structuring and way of planning teachings with the use of didactic scenarios in Natural Sciences' courses of Secondary Education.
The posed question at the research outset was referring to how a didactic scenario of Natural Sciences can be designed, structured, implemented and evaluated in Science courses of Secondary Education (Biology, Chemistry, Geology-Geography, Physics). The developed bibliographical inquiry was, mainly, carried out in the training material produced for the demands of two Training Programs for Secondary Teachers which supported by the Greek Ministry of education in last decade, also the relevant Greek and international bibliography on Natural Science teaching in schools. As bibliographical research result developed a design Tool for those are interesting to teach Natural Sciences in Secondary Education with the use of didactic scenarios. The Tool summarizes all the necessary factors that teachers have to take into account in preparing Science didactic scenarios, also, can be used immediately after the design, to assess whether it satisfies the principles, the objectives and the proposed methodology for learning and teaching Sciences in secondary schools servicing the principles of constructivism and the guided discovering teaching method. Six sectors has a design plan of a Science didactic scenario, the informative introduction, conditions for the implementation of scenario, educational goals, educational methodology, application procedure of scenario and evaluation.

Introduction

Modern learning environments must be properly designed to facilitate active and collaborative learning processes, to help students understand and not to memorize, to promote changes in their ideas, to bridge the gap between the activities that take place at school andthose at home, in society. In case of invalid alternative ideas, the conceptual change with cognitive conflict can be achieved in a climate that encourages the elicitation of student ideas and also challenges students to be interested in the teaching subject (Kassetas, 2008). The Science teachings in Greek schools mainly follow the traditional model, they are teacher-centered and the courses are entirely oriented in school books, without orientation the supplied knowledge to have application in the real world outside the school.

ICTs have entered, in recent years, deeply in Education, in all fields, in the educational administration, as an independent teaching subject, as means of teaching other cognitive objects (mainly educational software and learning environments) and as a communication medium.They are the mean for spiritual creation, for writing, reading, research and communication. According to Article 5A of Greek Constitution, everyone has the right to information, to participation in the Information Society, to facilitation of access to electronically handled information of which the production, exchange and dissemination is an obligation of the State. The application of new technologies in teaching and learning improves teaching methodology, enhances the ability to exchange information and knowledge between teachers and act as import factor of innovations in school. They promote the autonomous behavior of students, the teamwork by individualizing in the same time, so effectively be addressed the needs of students with variety of motives and different learning rates (Komis, 2004). New technologies can help students to thoroughly understand and assimilate the information, to share and spread ideas, to manage the information in a variety of ways to improve the generated intellectual work. The understanding of Science notions, facts and phenomena becomes easier through images, texts and sounds, with representations of the real world in virtual environments.

Teachers, as facilitators for introducing the new knowledge, need more comprehensive teachings to stimulate the interest of students and inspire them to seek the scientific spirit in the wisdom of previous generations and to search for the scientific truth when studying the natural world.Teachers are mediators between a rapidly evolving world and students who are preparing to enter in this world. According to the theory of information processing, teacher can positively influence the phenomenon of learning if use appropriate teaching means. Such are the stimulation of students' attention, use of guidelines, teaching aids, insinuations and questions but mainly the organization of the learning material according to certain principles and rules (Gagne, 1985 in Trilianos, 2004).

In Science courses students learn the structure and functions of the natural world, studying the phenomena, the principles and laws that governing them. ICTs help students to develop positive attitudes about the Science courses and subjects, to practice teamwork and to jointly search for the scientific truth. Moreover, through well-designed teachings help to improve students' self-assessment capability, helping to strengthen the self-esteem and self-image deeper, essential components of their character as one step before adulthood.

In this paper is described the design, the structuring and the way of implementation of didactic scenarios for Natural Sciences courses in Secondary Education. Adesign Tool summarizes the informative introduction, conditions for the implementation of scenario, educational goals, educational methodology, application procedure of scenario and the evaluation for those are interesting to teach Natural Sciences in Secondary Education with the use of didactic scenarios. The Tool can also be used for the evaluation of the prepared scenarios in the teaching planning phase, as

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forecasting evaluation.

Reasearch Method

In the research, it was followed the qualitative strategy with bibliographical inquiry (Cohen &Manion, 1994;Iosifidis, 2003). The posed question at the research outset was referring to how a didactic scenario of Natural Sciences can be designed, structured, implemented and evaluated in Science courses of Secondary Education (Biology, Chemistry, Geology-Geography, Physics). Because of qualitative research, data is written aspects, conclusions of surveys, descriptions and explanations, the synthesis of huge references on the research topics was a difficult hypothesis that demanded clear interpretation of the significance and the purpose, in accordance with the general scope of the educational evaluation (Dimitropoulos, 1996;Iosifidis, 2003).

The developed bibliographical inquiry was, mainly, carried out in the training material produced for the demands of the 'Major Training Program'(PI, 2011)and the 'Use and Exploitation of ICTs in the Educational Process') which implemented by the Greek Pedagogical Instituteand the Greek Teacher Training Organization (OEPEK, 2010), also Greek and foreign literature on didactic of Science teaching. In the research procedure it was followed axial coding, initially set the main 6 sectors of the scenario (which are the informative introduction, conditions for the implementation of scenario, educational goals, educational methodology, application procedure of scenario andevaluation). Then, the design areas determined by taking into consideration the theoretical findings. After them, the fields were fixed and summarized in the 'Design Tool of Didactic Scenarios for Science Teaching in Secondary Education' (Table 1). The Tool summarizes all the necessary factors that teachers have to take into account in preparing Science didactic scenarios, also, can be used immediately after the design, to assess whether it satisfies the principles, the objectives and the proposed methodology for learning and teaching Sciences in secondary schools servicing the principles of constructivism and the guided discovering didactic method.

Results and Discussion

Table 1 contains the sectors and areas of a designing scenario for teaching Science subjects in Secondary education.

TABLE 1. DESIGN TOOL OF DIDACTIC SCENARIOS FOR SCIENCE TEACHING IN SECONDARY EDUCATION

SCENARIO SECTOR	AREA
1. INFORMATIVE INTRODUCTION	a. Scenario's Identification b. ICT's added value to the didactic approach
2. CONDITIONS FOR THE IMPLEMENTATION OF SCENARIO	a. Scientific Knowledge and ICTs b. Skills for using specialized educational software and scientific devices c. Ensuring the necessary equipment for the implementation of scenario
3. EDUCATIONAL GOALS	a. General objectives of Natural Sciences' teachings b. Objectives of social content c. Goals of aesthetic content
4. EDUCATIONAL METHODOLOGY	a. Learning Theories Compatible with the Objectives of Scenario b. Teaching Strategies c. Methods and techniques of teachings
5. APPLICATION PROCEDURE OF SCENARIO	a. Organization of the class-learning environment b. Organization of the teaching procedure c. Development stages of a teaching scenario d. Worksheets and Flowchart of Teachings
6. EVALUATION	a. Evaluation of the Educational Objectives b. Evaluation of Scenario's implementation

1. Informative Introduction

a. Scenario's Identification

In the initial, informative introduction part of the didactic scenario are referred a. the Title of the didactic scenario, b. the contents, c. the names, specialties and positions of creators, d. the involved cognitive areas of Natural Sciences, e. the school classes which may be applied, f. the compatibility with the curriculum g. the estimated duration. A teaching Science scenario may be referred to a module and developed to more than two teaching hours inside and outside the classroom.

b. ICT's added value to the didactic approach

A teaching scenario can be entirely digital guiding students in virtual spaces or implemented in the classroom, the school laboratory, or in the field with real observations and measurements of Nature, or anywhere else can take place educational action. Of course, if the scenario proposes activities in various learning environment can achieve multiple educational objectives. It is preferable to be implemented by student teams than individually so, additionally to the cognitive objectives, the psychomotor and emotional goals can be achieved more effectively. When teachers plan a scenario they have to take into account the use of ICTs linked to the cognitive teaching, more specifically when, where, what and why to use software, the expected benefits, the multifaceted approach and added value of the ICTS' didactic approach, also the introduced innovative elements and the new roles teacher-student which change the educational climate of the classroom (OEPEK, 2010).

2. CONDITIONS FOR THE IMPLEMENTATION OF SCENARIO

A teaching Science scenario requires certain conditions to be applied in the classroom, in the Natural Sciences laboratory/ and in the school computer lab.The school should have the appropriate infrastructure, specialized for laboratory experiments or simulations in the school laboratories.If the scenario is mostly digital, optimal application results will be achieved when it take place in the computer lab and if it is mainly experimental, then specialized laboratory instruments and devices must be used.If the teaching scenario, total or a portion, will be applied in the field, outside the classrooms, it is also required the associated equipment

and the suitable worksheets for performing measurements and recording observations.

a. Scientific Knowledge and ICTs

The cognitive development of students is treated in teaching scenarios as product of social-cognitive conflict, placed in the convergence point of the social and cognitive (Komis, 1999). The social-cultural conflict occurs when a person experiencing a problem, makes some estimations and receives a coherent response from the social environment which clearly defends (Doise&Mugny, 1984; CoSy-LLab, 2008). So realize that, apart from its own point of view, there are also other considerations. This social-cultural conflict provides new information and opportunities for different responses, acting as a mechanism through which kids' thought led to higher-level of equilibrium (Komis, 1999). Apart from the required very good knowledge of the scientific content that will be taught in Physics, Chemistry, Biology, Geology, Geography, is also required, considerable knowledge in ICTs, since maps, books, magazines, newspapers are accessible through the internet and deepen the scientific content of teachings with the concentrated knowledge they contain and the openness to the society they have.

b. Skills for using specialized educational software and scientificdevices

According to the newest concepts of cognitive and didactic sciences,purpose of the educational process in schools is not only to provide specialized knowledge from various academic fields, but an interdisciplinary approach to knowledge and development of general skills of students, to learn how to learn and how to cooperate (Delor, 1996). Equipping students with these skills will enable them to meet the demands of everyday life and to participate in society as active citizens now and in the future (Anagnostopoulou&Lakka, 2007). In teaching and learning Science, many skills are cultivated in the laboratory so that students are able to handle laboratory instruments and materials, to carry out laboratory procedures and perform protocols through specifically designed worksheets, materialize and judge measurements, overcome difficulties, design and improve experimental procedures when requested.Students while slowly initiated in the Sciences' secrets, pass pleasantly differently and constructively several hours, discovering and cultivating deeper their artistic peculiarities and inclinations. It is enshrined in the students' mind that the acquisition of knowledge is inextricably linked to their personal creation. According to Piaget (1974), the purpose of education is not to increase knowledge, to teach more and more, but to create the possibilities for the person to discover, invent, and above all learn to learn.

Besides the school books and school laboratory guides, for the implementation of the activities of a Science didactic scenario, is required the use of specialized educational software that have been produced by the Greek Ministry of Education, The Greek Pedagogical Institute and the Greek Institute of Educational Policy, freely available on the internet. Specialized software can be used for the statistical analysis of the measurements taken in the laboratory experiments, export conclusions and present the results.

c. Ensuring the necessary equipment for the implementation of scenario

Suitable learning environment to support the implementation of a Science scenario can be developed inside the schools, in the classrooms, in the Science and Computer laboratories and outside the school, anywhere. Standard equipment of the scenario are the worksheets that contain the works' protocol, the required scientific knowledge of the teachings that will follow and guidelines for the use applets, experimental apparatus, special software and hardware. In all cases, guidelines for the use of the demanded teaching equipment are mentioned in the specific activities of the worksheets and advise students in more comfortable application of didactic tools, for easier and more effective approach to new knowledge.

3. EDUCATIONAL GOALS

The purpose of teaching with the use of didactic scenarios is to contribute to a better understanding, more comfortable and better familiarity with scientific concepts, relations and structures related to the taught scientific issue, in accordance with the didactic targets of the curriculum, syllabus and the schoolbooks. Thus, students will be able to use the knowledge in order to recognize, describe structures, distinguish features, interpret and correlate data, to distinguish similarities and differences, to classify characteristics and combine knowledge from other courses. The aim of the teachings must be the creation of suitable and rich environments where learners can interact and give meaning to their experiences, not only memorize concepts and events.The educational objectives in teaching and educational projects can be categorized into general, social and aesthetic or by another classification into cognitive, psychomotor and emotional (Anderson &Krathwohl, 2001; PI, 2002).

a. General objectives of Natural Sciences' teachings

The general objectives of Natural Sciences' teachings and the study of the environment in Secondary Education, apart from the most qualified directly related to the topic chosen, usually referring to the completion of students' general education and awareness of current reality, understanding notions and relationships in practice and familiarity with scientific research methodologies, self-education, to develop critical and creative thinking, to improve the observation skill, acquiring a variety of skills and familiarity with current communication equipment, finding information in the scientific literature, etc. (Koulaidis, 2007).

b. Objectives of social content

Objectives of social content are related to undertaking responsibilities and initiatives, obtaining a variety of experiences, developing scientific actions and collaborative relationships, teamwork, cultivation of the respect to another, discipline to the demands of the course and the team, promoting moral values of our civilization and configuration code of values and attitudes toward self, team and environment,better acquaintance and contact with the members of school community, other scientists and cooperation bodies, pleasant and carefree socializing with peers, encouraging participatory action.

c. Goals of aesthetic content

Goals of aesthetic content are related to awareness in different environment and culture, the culture of observation skill, detection and cultivation of deeper artistic, technical or scientific inclinations,skills, peculiarities and aesthetic sensibilities, highlighting the beauty of Nature and cultural heritage as perceived with the eyes of the soul and intellectual functions.

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For the cultivation of science inquiry skills, targeting questions and clarified tasks have to be asked about specific and concrete subjects, observations have to made about particular objects and events, investigations have to be planned to answer questions about particular phenomena, organisms and roles in the natures (Harlen, 2013).

The consciousness that ICTs combined with laboratory experiments and field measurements offer much added value to Science teaching contributing to the development of critical and creative thinking and awareness (Kapsalis et al, 2000).Students will be enable to understand the functional relation between science and technology, to become familiar with the scientific method, to handle the computer software and hardware and specialized scientific devices and apparatus, to carry out measurements in real and virtual conditions. Student working groups will be self-organized, with the roles be outlining and acting out, initiatives be undertaken among the classmates, thus satisfying psychomotor and emotional goals additionally to cognitive. Students on their own and in partnership, can reconstruct the knowledge and realize the changes that have occurred, under metacognitive processes, improving their self-assessment capability.

4. EDUCATIONAL METHODOLOGY

a. Learning Theories Compatible with the Objectives of Scenario

Learning theories that teacher ought to have in mind should be compatible with the goals of the scenario, the methodology can be used and the learning environment that can be created. The teacher-designer of Science didactic Scenarios need to know:a. the Behavioral, Cognitive, Constructive, Sociocultural learning theories,b. the 7 types of intelligence according to Gardner (linguistic, logical-mathematical, spatial, body-kinesthetic, musical, interpersonal, and intrapersonal. One type prevails and characterizes the person and the way of learning,c. the learning styles according to Myers-Briggs, the Sensing-Thinking type, Sensing-Feeling, Intuitive-Thinking and Intuitive-Feeling, d. The hierarchy of needs by A Maslow (physiological needs, needs of safety, social needs, recognition-prestige needs, need of appreciation, need of self- realization), e. the factors affecting learning (White, 1993).

According to the information processing theory, the human spirit, in a data processing system, through representations, models, structures and creates occasionally and in particular situations and for specific objectives (Gagne R., 1979 in Trilianos, 2004; Driver et al, 1993). The representations, as automatically active, help the new knowledge to gradually be subjected into the preexisting, to differentiate it, and finally, to be integrated with it (Vlahos, 2007). This is able because, according to Piaget, students are active producers of their own knowledge, depending on the growing stage and through their involvement in learning activities. With appropriate didactic activities in real and virtual environment, the world's representations as new knowledge are assimilated to the existing. If the new knowledge is compatible with the existing, it is adapted with reframing, if not, it previously causes cognitive conflict and reorganization, then adapted and brings equilibrium. The knowledge is associated with the action in order to cause the modeling and transformation of reality, depending on the learning environment.Between the model and the reality there is continuous communication in order the learner to interpret and understand new concepts, processes, systems and phenomena.

In the theories of constructivism, learning is individual process of knowledge building to amend the background information. In discovery learning which is promoted by the didactic scenarios, according to Bruner (1960), emphasis is given to the understanding of structures and scientific principles of the cognitive subject, so students to discover the scientific true and develop skills through experimentation and practice, and build up their knowledge-repesentation of the world around, by experimenting and extractingconclusions and rules from their experiences.

b. Teaching Strategies

Learning is achieved at individual and team level.i) At the individual level, students can carry out experiments, study educational material that serve the teaching objectives, investigate and gather information, analyze data and draw conclusions from measurements and observations. ii) The group-central way of teaching is component of all modern teaching interventions, with new technologies that provide opportunities for effective teamwork.Collaborative learning is achieved by sharing the work in groups, the assignment of responsibilities by the group members, the solving of problems often arise in groups. Meanwhile, communication skills improve, decreasing racist phenomena, democratic values are promoted and obtained positive attitudes about school and classes.

The group cooperation approach of scientific issues in schools can be done by heterogeneous groups, in terms of knowledge level on ICTS, which are treated a specific theme with the help of ICT, assisted by teachers and produce a result, which present to their classmates, discuss, evaluate and make projections and plans to answer the immersed scientific questions (Kartsiotis, 2008).

c. Methods and techniques of teachings

Guided discovery student-centered teaching is an active teaching method which develops intrinsic motivations of learning, and students work with the aim to discover the object of learning with the teacher coordinator and facilitator in their learning process (Komis, 2004; OEPEK, 2010). It is the opposite type to the traditional teacher-centered teaching, where transmission of knowledge becomes from the teacher-carrier of scientific knowledge to the student-passive receiver.The discovery teaching can have better learning outcomes today than in the past when it materialized with creative ways, such are simulations with appropriate educational software and digital tools or outside the school activities, in the field, in Nature (Kartsiotis, 2008). Various teaching techniques can be used in educational activities in and out of the classroom, in school laboratories and in the field. The teaching techniques are differentiated and adapted to the needs of students, the teacher's ability and availability of school infrastructure. The same theme can be taught with a variety of techniques to suit the target population and satisfy the teacher-designer.Computers can be used by the teachers in the classroom in a variety of ways.

For more comfortable, easier and more efficient introduction of new knowledge, in the planned educational activities can be used many methods, techniques and materials. The schematics, the pivot tables, painting, compositions, structures, script writing, the website creation etc. exploit the inclinations of students' and teacher's skills, cultivate creative and critical thinking, promote holistic approach to scientific issues (OEPEK, 2010; MTP, 2011). Especially for outdoor activities, Cornell (1979) suggests five principles of teaching in the Nature that help to work active

and constructively with educational quests: teach less and share more, be receptive, spur students' attention without delay, see and know first, talk later, the feeling of joy, either through fun either through peaceful adherence should infuses the experience of Nature acquaintance game. The ICTs and Multimedia environment is excellent space for "discussion groups", since the flow of new knowledge follows the constructivist method and the individual construction of knowledge, which is achieved with cognitive conflict. The internet in education works as a mean of access to a wealth of information, as a research tool and as a space for the implementation of educational programs. Thus, the traditional classroom changes and gets new dimensions in cyberspace, becoming more attractive and effective. In recent years it has developed a wide variety of specialized educational software which serves a variety of learning objectives and educational purposes, in the form of compact disks, website, robotics applications, and generic software, which can serve a variety of needs in Science teaching.

In laboratory experiments are taught concepts, terminology and laboratory methods, are given opportunities for students to feel in practice as 'young scientists', making the teaching of science courses enjoyable experience that rewards and encourages the student to deal further with the Science. The written objectives in the introduction of each experiment prepare the student about the experiment that will be carried out, the notions that will deal with and, if it is clear enough, reveal the secret of the experiment-the result. It is advisable, for many and varied reasons, the necessary materials to be easy to find, to be things that useδ in daily life (VanCleave, 1994).

In the context of a didactic scenario can developed the synthetic creative activities which instituted in 1998 in Greece but remained inactive, despite their importance in the educational process.They aim to develop the synthetic creative ability of students, and the ownership in initiatives, to cultivate students' critical thinking and exploratory attitude to knowledge, to push them to learn, even rudimentary, and slowly familiarized to the survey philosophy, while increase the interest for discovery and cultivates the students' talents (KEE, 1998). The subject can be selected by each student or a group who will make their research and they will present the results to the plenary of the class.

5. APPLICATION PROCEDURE OF SCENARIO

a. Organization of the class-learning environment

The required pre-teaching actions are the separation of students into small groups, the organization of the working groups and the allocation of responsibilities, alternatively, let the roles to emerge in groups and in plenary.Students will make groups of 2, 3 or 4 persons with at least one PC in each group.On each PC, teacher cares have been installed, in advance, software and the specific applications (applets) required to the activities of worksheets. The worksheets are saved to the desktop, so that the students simply pressing onto the links, they directly connected to the indicating website. Alternatively, if there are not all the possibilities, the lesson can be done in the classroom with one computer and one video projector. Internet offers the possibility of directly connecting with universities and research centers, national and university libraries of all continents, serving simultaneously as a social learning environment. If it is not available in the classroom, then teacher have previously downloaded all the demanded educational material for the scenario's implementation. A well designed scenario ought to have many alternative solutions so, in any case and in any way, to be applied.

b. Organization of the teaching procedure

The learning levels define a hierarchy of different learning kinds that conquered with different categories of skills with graded difficulty. At the first level, which is the lower, the informational, learning consisting in collecting information through the senses and memory functions that persons express usually with speech. At the second level, the organizational, learning, through comparison, classification, lay ought and hierarchy, makes interrelationships which eventually integrate into a broader conceptual schema. At the third level, the analytical, learning refers to intra-data correlations sought through analysisand inductive reasoning processes. In the fourth level, the practical, the person uses induction organization in patterns, principles and models of knowledge in order to explain, interpret, predict, evaluate and reorganize, beyond the surfacing structures of the data. On the above four learning levels is structured a Science teaching as an educational event (Matsagouras, 2007). Guided discovery is carried out at steps (Salonikidis, 2008).

In the beginning of the lesson, each group receives the materials and worksheets in electronic form, with instructions on what should be done in order to carry out the activities of the worksheet. Each activity contains questions where students must make their observations, assumptions and conclusions. Group members respond in writing to the provided space on the worksheet, after discussion with the rest members. The teacher intervenes only when is necessary, supervises and discretely directs the students' actions to develop initiatives and all students be participate.

c. Development stages of a teaching scenario

The development stages of a teaching scenario may be the following: the lesson begins with a question that will generate interest and concerns of students and will cause discussion and introduction to the teaching subject. The first activity allows the teacher to notify the teaching context and objectives of the lesson. With the first activitie, students are introduced to think through references to the knowledge they have acquired till now and reflecting upon structures, functions and mechanisms.With questions, the teacher can raise debate that can highlight possible misconceptions of students. Then, in the following activities, they deeper approach the subject with the use of specialized software and visiting appropriate sites. The stunning images and videos are attracting interest for observation and answering scientific questions. Students, having become familiar with the software and the specialized scientific websites are invited to answer open and closed type questions. The crosswords and multiple choice questions, constructed with special software, enable interaction and the consequent increasing interest. The last questions and activities are summaries which urge students to remember many things from those encountered in the in the previous activities, in order to deepen and refine the knowledge, synthesize information and generalize conclusions.Teachings, usually, close with the evaluation of the degree of objectives' achievement.

d. Worksheets and Flowchart of Teachings

The worksheets are designed in order to meet the teaching aims and content set by the Ministry of Education and the Pedagogical Institute of the curricula of Science courses (PI, 2002). In one teaching hour can be negotiated 3-4 cognitive aims with picked equal number of appropriate activities. The selection of appropriate

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materials and teaching equipment completes the spoken and written word, develops initiative and self-motivation of students, raising the interest of students, enhancing their will to learn, simplifies the teaching content, leads to more certain learning outcomes because by the use of them, many senses are involved in learning. During the teaching hours, students are asked to follow in detail the instructions of worksheets for more successful negotiation with activities.In order students answer the questions of the worksheets, they discuss with the schoolmates, makeuse of specific software, Internet, other apparatus and instruments, they observe, design, describe, combine, conclude and driven to the correct answer. The advantage of teaching by the use of ICTs is that the introduction of new knowledge done with supervisory manner that gives the student the opportunity to act by themselves (Koulaidis, 2008; OEPEK, 2010). The proposed software by the Greek Ministry of Education and the Greek Pedagogical Institute (uploaded on http://www.photodendro.gr) is very easy to use and require no special computer knowledge and hardware to run.Students are guided to use the worksheets with detailed instructions and informative photos, so they need a few minutes to familiarize with any software.With crossword's questions, easily, quickly and pleasantly checked the gained knowledge, also providing the opportunity to visit again some areas of the educational material, to elucidate points were probably blurred and confusing at first reading.

6. EVALUATION

Evaluation is supportive process of learning, which may be done by a variety of ways. The educational evaluation increases the motivation to learn in cooperative and mutual appreciation environments, both through noble competition. Students realize the degreeof conquered the new scientific knowledge and encouraged to achieve better learning outcomes with the personal satisfaction felt when they reward of their efforts to conquest the new learning objectives.In the teaching scenarios is good to apply the three main types of evaluation, the forecasting/primary, the interim/ formative and the final. The initial/forecasting evaluation concerns the teaching planning and materialized during the preparation phase of teaching. The interim/formative takes place during the teaching with questions, exercises and discussion. It aims to directly modify of the current and/or subsequent teaching to better respond to the students' needs (Duke, 1990). The final evaluation/ assessment is done at the end of teaching to determine the degree of achievement of the objectives (cognitive, social, emotional and psychomotor). Feedback follows the check of achieving the teaching objectives and whether, and to what extent, teacher's actions were directly related to the targets. Check can be done with various ways, among others are leaflets with different types of questions (gap-filling, multiple choice, true-error) and various forms of crosswords (PI, 2011).

a. Evaluation of the Educational Objectives

The degree of fulfillment of each teaching target can be used as a sub-criterion for assessment of the educational process and the students (KEE, 1998). The evaluation can be made to the educational objectives in cognitive, metacognitive and psychological level. The achievement degree of the cognitive objectives may be determined on the answers to the questions proposed in the activities, so that the teacher can draw conclusions about the effectiveness of the activities' content, the learning objectives set, the chosen techniques, the carried out teaching intervention.

Because in adolescence, the company holds a significant place in the lives of students and plays a key role in their development, the materialization of the activities in groups inside and outside the school offers increased hope for better students' participation and success of the course. Within the working groups shared roles and responsibilities, undertaken initiatives, break down and constructed friendships, skills and abilities emerge. It would be useful, with an exploratory discussion, students to reveal whether they could feel, realize and understand their position within their group, themselves in relation to others (psychomotor and affective goals).

b. Evaluation of Scenario's implementation

The worksheets of a successful didactic intervention should provide knowledge in supervisory way and push the students to act bythemselves. Thus, it must be checked if they help the student to observe, to design, describe and combine, to concern and conclude on the negotiated scientific issues. The worksheets need to be assessed whether achieve their teaching objectives and principles of the planned teachings. The students, through discussion, can recognize and express the difficulties they may have encountered in the implementation of worksheets about the timeframe, whether the instructions were clear, if the software was easy to use and suitable, if the worksheets contributed to the understanding of concepts and build up the new scientific knowledge. It is worth to be recorded the advantages-disadvantages of teachings by the use of suitable software and internet as well as teaching teamwork. In a meta-cognitive evaluation of the implementation of the didactic scenario, teacher and students are wondered about the effectiveness of methods and materials chosen, the difficulties encountered to reach the objectives set, the abilities and skills developed and the attitudes adopted by the participants.Because students have great familiarity with computers and Internet, the implementation of teaching in a way that leverages the most of new technologies, needs to be checked how attractive became the course and efficient were students and teachers.

Conclusions

The described'Design Tool of Didactic Scenarios for Science Teaching in Secondary Education' leverages the potential of ICTs for teaching in secondary schools. It summarizes all the necessary factors that teachers have to take into account in preparing Science teachings, also, can be used immediately after the design, to assess whether it satisfies the principles, the objectives and the proposed methodology for learning and teaching Sciences in secondary schools, servicing the principles of constructivism and the guided discovering teaching method. Six sectors and seventeen areas set in the scenario, 1. Informative Introduction: a. Scenario's Identification, b. ICT's added value to the didactic approach, 2. Conditions for the Implementation of Scenario: a. Scientific Knowledge and ICTs, b. Skills for using specialized educational software and scientific devices, c. Ensuring the necessary equipment for the implementation of scenario, 3. Educational Goals: a. General objectives of Natural Sciences' teachings, b. Objectives of social content, c. Goals of aesthetic content, 4. Educational Methodology: a. Learning Theories Compatible with the Objectives of Scenario, b. Teaching Strategies, c. Methods and techniques of teachings, 5. Application Procedure of Scenario: a. Organization of the class-learning environment, b. Organization of the teaching procedure, c. Development stages of a teaching scenario, d. Worksheets and Flowchart of Teachings, 6. Evaluation:

a. Evaluation of the Educational Objectives, b. Evaluation of Scenario's implementation.

Recommendations

The students users of specialized software and the Internet are able to interact with their learning environments, to synthesize, attend, intervene and direct their learning process.The virtual and real learning environments inside and outside the classrooms allow multiple representations and illustrations of the world by building mental models and cognitive schemes. Teachers can use educational applications, digital and non-digital, within and beyond the classrooms, during and beyond school hours, in students' homes, in the field, with teaching visits and educational pathways described in the worksheets of didactic scenarios, in order the scientific knowledge channeling to the school community and wider.

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