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Development of a school web site from young pupils as a didactical challenge

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Abstract: School projects, especially those concerning Systems Development, are realized by Software Engineering methods, mostly through their **software-life-cycle,** which is used in the present paper as a **didactic model** of problem solving. A challenge is issued to the children in the form of a concrete complex problem (“The Development of the School Website”) placing more emphasis on the didactic approach to the task of developing a site instead of the handling of software tools for creating a website. Finally the website development process is given, as it was experienced during the last few months along with specific problems encountered and final recommendations.

1. Introduction

Informatics courses (Pedagogical Institute, URL), in Greek Secondary schools (Gymnasium, age 13-15 years) are expected to help in the following:

- Emphasis on the *cooperative character of learning,*
- Encouragement of *analytical and compositional thinking*, and
- Acquisition of certain *skills and abilities of methodological character*, that will help pupils in the Information Society.

It is also expected that pupils learn how to formulate their thoughts clearly, and how to set goals and achieve them. One way to accomplish these goals is to get involved in **school projects**, which can be considered as the trademark of the "**Learning by Doing**" method. According to this, the pupils are self-motivated and demand a more responsible and independent work from themselves. The reasons are the following:

- Learning is a self-guided process and pupils live their own experience.
- Learning is a result of cooperation. The experience of the pupils are discussed in the group, and pupils learn through discussion how to argue, formulate and support their views. This results in the reinforcement of their self-awareness and sociability.

Moreover, through cooperative learning pupils are involved in the process of **problem solving** so they develop ability and accumulate experience, to succeed in their lives and jobs. Since school is the basic environment, where pupils are learning both knowledge and skills, it is necessary to deal with complex applications (not only simple tasks), since the principal aim is not the creation of products, but the process of developing skills. During such creative activities, processes are taking place and experience is accumulated.

The didactic approach in such a learning environment where processes of development of complex software systems are taking place, offers and encourages not only cooperativeness and skills in complex problem solving methods. It also includes knowledge of different areas, such as Finance, Technology, Mathematics etc., since the concept of the "**project**" characterizing the development of a software system is in principle interdisciplinary.

This paper will relate the methodology used to bring to fruition the school project (*informatics courses of 1st Gymnasium grade, age 13 years*) according the curriculum described above. A challenge was issued to the children in the form of a concrete complex problem ("*The Development of the School Website*"). Emphasis was placed on the **didactic approach** of developing a site instead of handling software tools for creating a website. School projects, especially those concerning Systems Development, are realized by Software Engineering methods, mostly through their **software-life-cycle**. So, for the first part of this discussion we give the definitions of some basic S.E. concepts. Then we show examples for approaching these concepts in the classroom at the pupil's level. Finally we present the website development process as it was experienced during the last few months along with specific problems encountered and final recommendations.

2. Pedagogical approach – Didactic objectives

2.1 Methods of the Software Engineering as "Content and as Didactical principle"

After the software crisis(1968) the software industry is using a systematic approach for the production of new software programs. The first step is an appropriate model for the new software program. One should be able to at least analyze a model to determine the intended operation of the system which also can be used for other analog problems. Therefore, methods for developing models and programs are included in the curriculum of the Information Technology course[1]. Although the S.E. methods are usually associated with large scale projects, these methods and basic concepts can also be used for the school website project. These methods are closely related to the concept of problem solving. During the process of problem solving the people use some "*assistance*", which support them by the:

- *Analysis of the problem*
- *Design of a solution*
- *Implementation of this solution*

This same assistance also exists in the Systems Development. One sort of assistance can be the **methods**, i.e. the set of rules that guide the designer in the process of his problem solving, another sort of an assistance can be the **case tools** which support the methods or even automate these. It is important to say that almost all the projects have basically the same structure and that the systems during their development will pass from a certain number of concrete phases, called as the **software-life-cycle**.

2.2. The software-life-cycle of a project as a didactical model of problem solving

The school projects that deal with the Systems Development are based on the methods of S.E. and their solutions resemble the solutions as they are fulfilled by most enterprises of

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[1] The module «**Application Development in Programming Environment**» in the 3' class of the technological discipline of the Greek Secondary schools(Lyceum, age 16-18 years) is obligatory.

developing software, i.e. in the course of a model phase. Usually (Graham, 1995) these phases are described as:

- *Analysis,*
- *Designing,*
- *Coding/Implementation,*
- *Testing/Control,*
- *Delivery and Acceptance/Maintenance.*

Another basic term of S.E. is the concept of "*principle*". According to DUDEN (1993), the "principles" as well as the "techniques" are important during the process of Systems Development. Some of these principles (*Abstraction, Classification* , *Modularization***)** were used in the creation of the website, as will be shown in the following sections.

3. Practical approach – The development of WebPages in the informatics course

3.1 Educational Activities

The educational activities during the development of web pages were separated in 3 phases:

- **Comprehension** and **exploitation** of certain basic concepts which the pupils had been previously taught through other courses/lessons (structure, architectural/design, classification) and are considered important in the S.E. Through examples of everyday life or school praxis these concepts are emphasized and brought into the abstract world of Software Technology. Thus on one side is cultivated considerably the abstract thinking skills of pupils and on the other side the pupils begin to relate those concepts to Software Technology. Also the **Understanding** that the objectives of informatics course are related to the acquisition of skills of problem solving, i.e. developing of software systems, should be based on the process of Systems Development.

- **Comprehension** of basic terms and concepts of Internet/Multimedia.
- **Building** of teams and **design** the content of the school website.

3.1.1 Understanding the basic concepts

It is believed that the use of hypermedia systems can be greatly simplified if it is based on knowledge that already exists in the minds of users. This can be achieved with the so-called **metaphors** (George Legrady's, URL), where the user/pupil is given a part from reality, with which he is already familiar with, either from facts of everyday life, or through school activity. In this way, and with the help of **analogy,** the pupil has the ability to infer what lies behind objects, operations, and concepts, and also can see the structure of the whole system. The best-known example of the use of guidance is the **desktop metaphor** in the Windows and Macintosh interfaces. Other examples that are significant to the process of web page development are the concepts of:

- **Structure -** pupils have previous knowledge of this through; grammar (structure of a sentence); biology and chemistry (structure of atoms/molecules); and of essays/composition and reports (prologue, main body and epilogue).
- **Architecture** and **Design**
- **Generalization, Modularization** and **Hierarchical Classification**

Through the comprehension and consolidation of these general concepts the pupils were able to:

- Understand that the general concept "**school**" must be analyzed and that in this analysis the various aspects of the above concept must be described in a logical order. The method that was followed for the analysis of the concept "school" was based on the syntax of an **analytical outline**, so that the description of the website to be based on a systematic preparation. With the analytical outline, the pupils were able to recognize the various aspects of the notion "school", that mapped out into simpler and more familiar elements. This distinction into familiar elements was a personal choice and the target was to understand better the notion "school". The pupils broke the concept of "school " into seven elements (following the structure of an essay):

  a) **Prologue** a brief introduction, mentioning the name of the school and welcoming the guests.

  b) Report on the school's inter- disciplinary projects that took place in the classes of Technology/Informatics.

  c) Report on different school activities, such as athletic, artistic.

  d) Reports on the Address/Communication and Friends/Benefactors

  e) Report on links for which the pupils show particular interest

  f) **Epilogue** (a brief synopsis of the *4th Gymnasium of Ampelokipon*). Report on certain important points with broader meaning for the visitors (e.g. the geographical location of the Gymnasium, the number of pupils, etc).

- Realize that a school website, despite its fluidity, in general lines can follow the structure and the architecture of an essay: it has a prologue, a body, and an epilogue. The detailed design, drawn on paper, constituted the various aspects of the concept "school", and takes the place of a school website model which in general terms fulfils the analytical outline.

Next, we give the specific examples of the classroom activity that familiarized the pupils with these concepts and related them to the Software Technology.

3.1.2 Concepts of Architecture / Design through examples

Many children are familiar with the concept of "*Architecture/Design*" as the science that teaches which shape, form, dimensions, esthetics, and practicality should an architect give to a building. Based on these objectives and according to the design, then the result will be a building that is in accordance with the expectations, suitable for its intended purpose and at the same time pleasant. The concept of "*Architecture*" can be used similarly for an essay. This technique helps the pupils to transform their ideas into a text, so that the reader will be able to follow and to understand the text relatively easy. So, their essay should have a start(prologue), a middle(main body) and an end(epilogue).

Accordingly, this knowledge can be used in the school's website design. The main goal in the design phase is to understand that, like in an essay, each pupil has his/her own way of analysis and composition. They can comprehend that there can be many different "**designs**", a fact that led to the conscious selection of groups from each class for the one and the same WebPage. So the principle of **Modularization** can be found here and its practise is explained on the next page.

3.1.3 Concepts of Hierarchical Classification / Modularization

Modularization on the school node refers to the division of the general concept "**school**" into separate parts (aspects). In this way, individual parts can be modified without the need to conduct changes to other parts of the system. Some advantages of Modularization are:

- Distribution of activities/actions among many pupils
- Replacement of a part of the description from that of another pupil with better results

The presentation of the school information was implemented with the method of **Classification,** which the pupils are aware of from the school textbook of informatics (Pedagogical Institute, URL). A first **grouping** of information was implemented through the distinction of the different aspects of the general concept "school". In this first phase of website's structure the pupils needed to understand general rules such as:

- Each WebPage must contain homogeneous, or related, information.
- The title of each WebPage is indicative of its content.

3.1.4 Acquaintance / Understanding of basic concepts of Internet/Multimedia

The website development project should aim toward developing in the pupil skills to be able to know and understand the concept of Internet and get to know its possibilities. A vast collection of information is currently being stored on the Internet making it the library of tomorrow. Pupils and as well as teachers need to learn how to search for and organize this information efficiently. Specific questions regarding the knowledge of tools were discussed such as: What is a website, browser, e-mail, search engine, HTML, hyperlink, and so forth.

3.1.5 Building of class teams

The website should reflect to a very high degree the school environment. By having the pupils design it themselves promotes for them a sense of community as well as gives a feeling of pride in ownership. Pages were reserved for each individual class so that they would each have an opportunity to show their own view of what was important and unique about themselves. A challenge was issued to the pupils in all classes to create teams to represent their particular class. It was not a surprise that from each class the team chosen consisted of the top pupils in those classrooms. As mentioned before, the process of website development is closely related to problem solving which is the skill that makes these top pupils successful in the first place. These teams then went on to the standard phases of Software Development:

- *Analysis of the content*
- *Design*
- *Implementation*

- *Maintenance*

3.2 Design Phase

In this design phase the pupils worked from flow-charts of gathered information that had previously been analyzed. This paperwork served as an outline of the structure and helped with problem solving toward the solution. It was decided that each pupil would choose the specific piece that he/she wanted to work on. There were certain restrictions and guidelines that the pupils had to follow to ensure that the result would agree with the school's policies. When the project was completed the pupil's many diverse views of the school intertwined beautifully within the site showing a view of the school as a whole that the children had not seen before. It is remarkable to say that prior to the completed project there was *not a pupil on any of the teams* that knew *the proper address* of their school!

3.3 Implementation and Maintenance

In the implementation phase the pupils transform the school data, text, and pictures into WebPages via web authoring tools. Although not a student was familiar with these tools, there was not a problem. However a lot of time was spent on familiarizing the pupils to the process and to the basic concepts of Internet/Multimedia. The tangible results of the produced WebPages enabled the pupils to have a more concrete base for discussion of further steps. The next step was to choose only the best parts of their work and also to decide on a school logo for the site. The product was then finished.

Once a website is established live then it must be maintained so that the information is current. The site can be updated as new events occur, and this ensures that the site remains viable.

4. Problems encountered

Problems of communication and collaboration between the members of teams were not observed. The bigger problems were:

- Initiative and the effort in the information collection phase. Certain members of teams met difficulties in gathering the information they had been assigned. Difficulties also resulted from the choice between what information would be written in full text and what would be in synopsis form.
- During the implementation phase pupils spent much time on unnecessary details.
- The technical infrastructure of laboratory. There existed only one computer connected to Internet (Pentium of 1/133 MHz) equipped with a hard disk of only 1-Gigabyte capacity. Due to this the team members had limited access. The schools six other PC's were usually occupied.

The pupils "were not allowed" to view other school sites on the web to ensure that the product they created would be from their original ideas, free from outside influence. With respect to this they were all ignorant of what the final product would be.

5. Synopsis and Conclusions

According to this concrete example of building the school Website (URL), for the "*4th Gymnasium Ampelokipon*" the conclusions which can be presented here are that: The design of a live school website is a complex and extensive activity which requires from the pupil:

- Convenience in the selection of information and exercise of abstractive faculty on the right selection, classification of what will be used.
- Knowledge of basic advantages of good writing (right formulation, clarity, style, politeness).
- Responsibility for the planning of a big project.
- Skills in the use of PC and other tools for building of web pages.
- Cooperativeness and virtuosity in techniques of problem solving.
- Knowledge of the process of Systems Development (model-phase), and the proper placement of the web text for clarity of message, ease of navigation and proper aesthetics presentation.

This project has inspired pupils to think about acquiring real-world skills that will be important in the marketplace. The success of this project at the pupil-team level stems from the fact that the website that they created is uniquely a product of their own creativity and skills. It also motivates them to become more deeply involved in the sense of community that lies within their school. They look at their school through different eyes now. It becomes less of an irrelevant space that they are required to spend time in , and becomes more of their own space. A space where they live and create, and the more they know about it, the more they love it.

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