The mediation of hand-held instruments vs. dynamic geometry software in the formation of geometric concepts of perpendicular and parallel lines by children in two different cultures

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Abstract
The reported study adopts a theoretical perspective on human thinking developed by Vygotskian socio-cultural school and focuses on the process by which children appropriate formal geometry concepts of perpendicular and parallel lines within the context of a teaching experiment carried out in two culturally and educationally different environments. Four groups of children attending the 4th class of primary school and the 1st class of lower secondary school in Greece and four groups of children attending classes at corresponding school levels in Jordan (a total of approximately 130 students in both countries) were posed a series of geometry tasks asking them to identify, define and construct parallel, perpendicular and intersecting at various angles lines on a plane in two different situations. Half of the students in each group were posed and carried out the tasks on a squared paper having at their disposal the traditional hand-held geometric instruments of ruler, protractor and right-angled triangle as well as a pencil whilst the other half of them encounter the same tasks on a computer using the dynamic geometry software of GeoGebra4 after having introduced to it. Our study paid attention on the qualitative differences induced by the two types of tools adopted in the teaching and learning of parallel and perpendicular lines and to the extent to which these different types of tools contributed to the appropriation of geometric concepts. The data collected and analyzed adopting an analytic framework based on Van Hiele levels of geometric thinking. The main findings of this analysis indicate that the use of geometric tools either material or computerized have an overall positive influence on the formation of analytical concepts of parallel and perpendicular lines on a plane by children in both cultural and educational environments of Greek and Jordanian schools. On the other hand, the use of computer and dynamic geometry software, despite its tools offered and their functional capacities, they seem not to structure in a radically different fashion than traditional hand-held instruments the activities of indentifying and defining parallel and perpendicular lines on a plane bringing into play qualitiative different thinking and acting processes concerning the appropriation of the fundamental geometry concepts that were investigated in this study.

Key-words: teaching-learning geometry, dynamic geometry software, Geogebra
1. Theoretical background

1.1 Drawing instruments in geometry
Geometry has been founded on the use of instruments with particular emphasis in compass used for drawing circles and arcs and straightedge used as a guide for the pencil when drawing straight lines. Euclid’s “Elements”, the founding text of geometry, implicitly defines and clearly theorizes the use of drawing instruments both for defining geometry concepts and for solving problems by proper geometric constructions, although the instruments are never directly quoted. Compass and straightedge as well as their rules of use correspond to axioms and theorems of Euclidean geometry and for any given geometric construction there is a theorem stating the relationships between the elements of the geometrical figure represented by the drawing produced [1].
The radical transformation of geometry from the classical static constructions restricted by the use of compass and straightedge to geometric investigations resulting from mechanical motions, which took place during the 17th century, raised in the novel context the issue of drawing instruments and devices. During the followed 18th and 19th centuries drawing instruments of many types were designed and adopted in geometric investigations. The development of computer technology and dynamic geometry software renew the interest for the tools used in geometry, although from a qualitatively new viewpoint.
The crucial role of using drawing and measuring instruments in learning geometry is supported by the Vygotskian perspective of tool mediation [2]. A central claim of this perspective is that children’s mental functioning and development can be accounted for in terms of their engagement in culturally organised practices in which technical and symbolic tools play a crucial role. Such tools have been developed in a culture over extended periods of time and have become an integral part of human activity. By acting as mediators, technical and symbolic tools, structure human activity and bring into play differentiated mental processes which in turn regulate and qualitatively transform that activity. Mediatory means, thinking processes, and human activities become functionally intertwined in their development, shaping each other in a dialectical interdependence.
In this account it is assumed that the use of different types of mediatory means structures practical activities in different ways and hence has a differentiated impact on thinking and, consequently, on the genesis of concept-appropriating processes [3].

1.2 Concepts of perpendicular and parallel straight lines
Children are taught in school geometry both in Greece and Jordan, that two straight lines are perpendicular to each other if they form congruent adjacent angles, i.e. if they are at right angles (90°) to each other. Therefore, it may be easily verified if two straight lines are perpendicular or not by using a right-angled triangle (a modern version of gnomon) or a protractor.
On the other hand, school geometry includes three equivalent but different definitions of parallel lines on a plane. First, two straight lines on the same plane are parallel if they are the same distance apart at any given point. Second, two straight lines are parallel if they do not intersect even assuming that they extend to infinity in either direction. And third, two straight lines on a plane are parallel if they share a transversal line through a point that intersect them at right angles, i.e. if they are both perpendicular to a third straight line, or more generally, if they form equal the corresponding angles of intersection with a transversal line.
Therefore, it may be claimed that two straight lines on a plane are parallel or not by measuring their perpendicular distance at any two points using a ruler or by inspecting if they are perpendicular or not to a third line or if they form equal the corresponding angles of intersection or not with a transversal line using a right-angled triangle or a protractor.

2. The teaching experiments
This study focused on differences in children’s thinking impacted by the use of hand-held instruments vs. dynamic geometry software in a series of tasks asking to identify, define and draw parallel, perpendicular and intersecting lines on a plane. The inquiry was undertaken within the context of a sequence of experimental situations in two culturally and educationally different environments during the school-year 2011-12. Four groups of children attending the 4th class of primary school and the 1st class of lower secondary school in Greece and four groups of children attending classes at corresponding school levels in Jordan (a total of approximately 130 students in both countries) participated in the study.

These students, who had been taught before our experiments in their regular math classes the concepts of parallel and perpendicular lines on a plane, were posed a series of tasks asking to identify, define and construct parallel, perpendicular and intersecting lines on a plane in two different situations. Half of the students in each group were posed and carried out the tasks on a squared paper having at their disposal the traditional hand-held geometric instruments of ruler, protractor and right-angled triangle as well as a pencil whilst the other half of them in each group encounter the same tasks on a computer using the dynamic geometry software of GeoGebra4, after having introduced to it by the researcher.

GeoGebra4 was selected from the pool of available software packages for mathematics teaching and learning for many reasons, the main being that it is available both in Greek and Arabic language and so it could be used in the two cultural and educational environments of our study, it could be utilized in the grade levels of primary and secondary schools selected for our teaching experiments and its users can use the software intuitively without having advanced computer skills [4].

In the first stage of our study reported here, the experimental tasks required the identification, definition and reasoning on the relationships of straight lines on a plane with particular focus on parallel and perpendicular lines. In these tasks the students were given figures of two lines drawn on a squared grid and asked to identify their relationship (perpendicular, parallel or intersecting) and to justify their responses. In the justification part of each activity the students were asked to provide evidence for their claims so as their conceptions of perpendicular and parallel lines to be deduced. Attention paid on the qualitative differences induced by the two types of tools used in identifying and defining parallel, perpendicular and intersecting straight lines and to the extent to which these different types of geometry tools contributed to the appropriation of these geometric concepts.

The data of the study are children’s responses to the tasks and their interviews which registered their voices as responses to the researcher’s questions as well as the researcher’s notes. The data were analyzed adopting an analytic framework based on Van Hieles’ levels of geometric thinking enhanced by observations concerning the utilization of geometric instruments by children in offering and supporting their claims [5].

3. Key findings
The key findings of our analysis indicate that the use of geometric tools had an overall positive influence on the formation of analytical concepts of parallel and perpendicular lines by children in both cultural and educational environments of Greek and Jordanian schools. The percentages of children who based their arguments about the relationships of two straight lines on the use of a suitable geometric tool increased significantly after our teaching experiments, which involved discussions between children and researcher on the characteristic properties of perpendicular and parallel lines. On the other hand, the use of Geogebra4, despite its dynamic computerized tools and their functional capacities they seem not to structure the activities of indentifying and defining parallel or perpendicular lines in a radically different fashion than traditional hand-held instruments. According to our evidence, the radically different type of dynamic geometry software tools they did not brought into play qualitative different thinking and acting processes at the level of appropriating the fundamental geometry concepts investigated in this study.

The following extracts of children’s responses to a task are illustrative. Children having at their disposal a ruler, a protractor and a right-angled triangle as well as a pencil were asked to identify the relationship of two lines and to justify their responses (fig. 1).

The majority of the children both in Greek and Jordanian schools claimed that the two lines are intersecting based exclusively on a visual appreciation. Asked by the researcher to justify their claims most of the children picked up the ruler and - ignoring its equally spaced markings along its length for measuring a distance - use it as a straightedge extending the two lines so as to be clearly visible that they intersect at a point on the paper sheet.

![Fig. 1: The two lines are…. parallel, perpendicular or intersecting at an angle?](image)

Very few children in both educational levels and environments of our experiments used the ruler and measured the distance between the two lines in order to verify their claims that the two lines are intersecting.

The same task was posed on a computer to the children who asked to respond using the tools offered by the dynamic geometry software of GeoGebra4 (fig. 2). In previous sessions of this experimental activity the children had been introduced to the tools and functions of GeoGebra4 by the first of the researchers.
Most of the children in Greece and Jordan in both educational levels - although using the tools offered by Geogebra4 and their functions - responded to the task in a similar way to the children who used the hand-held geometry instruments and a pencil on a sheet of paper.

They initially claimed that the two lines are not parallel but intersecting on the base of their visual appreciation and then justified their claims using the “Line tools” of Geogebra4 (option “Line through two points”) to extend the two lines in both directions and the “General tools” (option “Move graphics view”) to change the zoom of the graphics view so as the intersection of the two lines to be clearly visible.

That is, the children in this experiment simply replaced the material hand-held ruler by the line drawing functions offered by Geogebra4 without structuring their activities of indentifying and defining the relationship of the two lines in a radically different fashion than that of using the traditional ruler and pencil on a paper. The only difference was the use by the children of zoom facility offered by Geogebra4 in order to verify without any doubt, their claims that the two lines are intersecting or not. Verification visually appreciated by children and mathematically affirmed by the software utilities. It is interesting that few children used the “Measurement tools” of Geogebra4 to measure the angle formed by the two intersecting lines in order to offer an additional justification of their claims and fewer used the same tool to measure the perpendicular distance between the two lines at any two points.

In conclusion, on a first level children used the drawing facilities offered by Geogebra4 to facilitate the material aspects of the geometry tasks, i.e. the extension of lines or the measurements of distances and angles, while they did not change the tasks conceptually and on second level they utilize Geogebra4 as a visual amplifier in identifying the relationships of two lines on a plane, since it is easier and more reliable to observe that two lines intersect or not in one point by zooming the diagram using the graphics view tool of the software than in a static paper-and-pencil diagram. In any case, children’s responses to the tasks seem not to be affected by the dynamic geometry environment.

Summing up, it may be claimed that the children responding to tasks have not exhibited significantly different thinking processes and acting behaviors both in the two qualitative different experimental situations and in the two educationally and culturally different environments.

4. Conclusions
Two conclusions may be drawn from an analysis of the above reported findings. First, it seems that the instrumental approach suggested by Verillon and Rabardel, which
distinguish artifacts (technical and conceptual tools) from instruments is endorsed by the findings of the present study. According to Verillon and Rabardel, an artifact is a material or abstract object, already produced by human activity, which aims at supporting new human activity in carrying out a type of task (e.g. a ruler or an algorithm for solving equations). An artifact is given to a human subject while an instrument is built by the subject from the artifact. An instrument may be psychological or material, but above all, is subjective, linked to a subject’s activity and developed by the subject for responding to a given task. The transformation of an artifact to an instrument, a complex process so-called instrumental genesis, is linked to characteristics of the artifact and to the subject’s activity, her/his knowledge and former working methods. The process of instrumental genesis has two components, the first one directed toward the artifact which is shaped by the users’ activity and the second one directed toward the subject, whose activity is shaped by the artifact. In this process, a subject in order to perform a task constructs an instrument, which is composed of both artifact and subject’s utilization schemes which allow her/him to perform the task and control her/his activity [6].

According to the evidence of this research, children have not transformed conceptually the available material and computerized geometric tools to proper geometric instruments for responding to tasks concerning the relationships of two lines on a plane. An explanation for this deficit may be sought to the practices of incorporating geometric tools in the teaching of geometry in schools both in Greece and Jordan.

Our second conclusion concerns the complexity of geometrical thinking and the corresponding cognitive demands required by children. Duval suggests that three types of cognitive processes are involved in geometrical reasoning: visualization processes supporting the visual representation of a geometrical statement, construction processes related to the use of geometrical tools and reasoning processes making possible the extension of knowledge, explanation, argumentation and proof [7]. As Duval points out, these different processes can be performed separately, however, are closely connected and their synergy is cognitively necessary for proficiency in geometry. The findings of our research indicate that children’s geometric reasoning is based primarily on visualization processes, which are not connected to construction and reasoning processes related to the identification and definition of perpendicular and parallel lines on a plane.

Given that the synergy of visualization, construction and reasoning processes is necessary for appropriating geometry concepts and theorems, an important issue is their integration to the incorporation of tools – material and computerized- in the teaching and learning of geometry.

In summary, whatever the tools, their integration in geometry learning and teaching necessitates considerations of children’s instrumental genesis in terms of the cognitive processes which are involved in geometrical reasoning, and especially in their synergy.

References


Teaching Thermal Comfort: a teaching intervention that takes into account student preconceptions

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Abstract
Most people, when they hear the term thermal comfort, think it is determined by a single factor: air temperature. Nevertheless we know it's possible to feel cool, even cold when the thermostat indicates otherwise. Air temperature should always be considered in relation to other environmental and personal factors.

If for most people knowledge of the subject has little or no importance, for technicians of relevant specialisations a solid knowledge is required. Building a teaching intervention which permits the clarification of matters and the representation of the whole set of variables that contribute to thermal comfort for secondary school students is not an easy task. In a subject like this, rich in alternative student conceptions, it is necessary to start with an exploration of student ideas on the subject. That’s what is done first in this research work.

The main findings are that air temperature is the basic and often the sole factor proposed as contributing to thermal comfort, whereas humidity and air velocity are rarely proposed. Radiant temperature seems to be totally absent. Moreover a poor understanding of heat transfer is registered, which partly explains difficulties in representing thermal comfort. The findings are used as the basis of constructing a teaching intervention presented in this work. Among other actions proposed in this teaching intervention and described in this paper the use of a free access software tool called “comfort calculator” is proposed.

Key words: Teaching/ thermal comfort /preconceptions/comfort calculator
1. Introduction
Most people, when they hear about thermal comfort, think it is determined exclusively by air temperature. Nevertheless it is known that it is possible to feel cool or even cold when the thermostat indicates otherwise. Air temperature should always be considered in relation to other environmental and personal factors. In the first category of factors (ASHRAE, Standard 55, 1981) there appear, apart from air temperature, air velocity, humidity and radiant temperature. In the second category of factors there are clothing insulation and activity levels. Research work steadily tries to evaluate the contribution of each of these basic factors or the combined effect of some of these factors on thermal comfort (Al-Othmani et al., 2009, Hodder & Parsons, 2008, Lee & Obendorf, 2007). However, thermal comfort can not be objectively defined: Conditions, where a large number of people are simultaneously and unanimously satisfied with the thermal environment cannot be imagined. ASHRAE definition includes this subjective factor: “that condition of mind which expresses satisfaction with the thermal environment” - ISO 7730 (Darby & White, 2005). So, thermal comfort is not merely measured by instruments. Following works of Fanger (1970) ASHRAE speaks about Predicted Mean Vote (PMV) for any given environmental conditions and defines the maximum acceptable level of dissatisfaction (index PPD, Predicted percentage dissatisfied) for a study of thermal comfort conditions in buildings. (Γομάτος & Λύτρας, 2002, Τσιμάνος, 2008)
Thermal comfort being a complicated concept as described above, has to be worked out carefully in engineering courses. But it concerns not only engineers, heat and refrigeration technicians have to comprehend well the concept of thermal comfort. However this significantly rich domain, linked to a lot of thermodynamic notions such as heat, humidity, temperature, heat transfer, closely linked as well to fluid mechanics, poses difficulties to students. Some of these difficulties come from the fact that elaborated scientific knowledge often contradicts spontaneous thinking. According to Kampeza & Ravanis, (2012:115)“The representations that children form on the basis of their everyday experience about the phenomena of the natural world and science concepts often display features that are incompatible with scientific knowledge.” So student ideas on a subject have to be searched for and taken into account in the process of new learning (Driver et al, 1985, Kerr et al, 2006, Baviskar et al, 2009). The consideration and evaluating of students existing ideas can lead to an ‘interactive chemistry’ in the sense that Day (2000, p.108) defines, as we can engage children by starting with their ideas and helping them to build on what they already know. Along with Shepardson (2002) it is claimed that it is important to access student ideas, understand and incorporate them into curriculum development and instruction design, in order to promote learning. This is what is done in this work: trying to build a teaching intervention sketch based on student ideas which were previously attempted to be researched.

2. Method
In order to investigate student ideas a written questionnaire was prepared and handed out to students in the 11th and 12th grade of a vocational senior high school. Students attended the mechanical engineering sector of the school. Those in the 12th grade had already chosen the specialization “refrigeration and air conditioning technicians” and had been taught thermal comfort as a subject. Forty five students answered the questionnaire, 30 in the 11th grade and 15 in the 12th grade.
The way in which learners’ ideas and understanding were brought out is nearer to the
“phenomenological” one, following the division of Driver and Erickson (1983) to
“phenomenological” and “conceptually based” approaches. This means particular
phenomena were presented to learners and situations asking them about how things
happen or to make predictions. For instance the ‘summer rain question’ was asked

- We often feel warm after sudden summer rain. Why do you think that this
  happens?

the roof ventilator question:

- The use of roof ventilators is usually recommended instead of split air
  conditioning units. Does it work in your opinion? Is it equally efficient?

the “air conditioners” question:

- Air conditioners are going to be installed in a workshop, an office and a
  house of the same surface area. Should air conditioners of the same power
  be installed? Justify your answers.

or the “heat convention” question:

- We often put the pot on a hot plate of an electric cooker in order to warm
  up the water (fig. a). Would it be equally efficient to put it on a piece of ice
  (fig. b) when we want to cool the water it contains?

The advantage of these questions lies in the fact that the respondent is free to use
his/her own language and terminology and questions are likely to invite
participation. The disadvantage is of course the risk of getting confusing
information and not easily codable.

On the other hand two of the questions in the questionnaire, the initial and the final
ones, remind us of a conceptually based approach:

- What do you think when you hear the term thermal comfort?
- Under which conditions do you think that people feel satisfied from their
  thermal environment?

3. Results

Here are the main findings of the research concerning student ideas:

- Students tend to perceive thermal comfort as a situation of comfort in winter
  conditions: not to feel cold and therefore not to need more heating. They rarely refer
  to summer conditions: not feeling warm thus not needing additional cooling. This
dissymmetry is certainly related to language (at least regarding the Greek language)
when the adjective “thermal” is of the same etymology as the word “heat”. In any
case this idea on thermal comfort has to be enriched during teaching intervention, so
that students cover both dimensions when thinking about thermal comfort.

- The role of relative humidity is undervaluated as is shown by answers to the
  ‘summer rain question’ as well as to the final question. Eleventh grade students
  seem to ignore its role whereas this factor is proposed by about half the students
  who had already been taught about thermal comfort (12th grade).
Figure 1. Percentage of students referring to air humidity as an explicative factor to the ‘rain question’.

- Radiation is connected almost exclusively to sun-earth radiation. Heat radiation from one body to another in a building is not given as a factor contributing to thermal comfort.
- The chilling effect of wind is underestimated as is shown by answers to the ‘roof ventilator’ as well as to the final question. Students do not have a clear understanding of the contribution of air velocity to thermal comfort.
- Students when asked about the factors contributing to thermal comfort usually cite only air temperature. They rarely speak about other factors and when so their number is usually one or two. The fact that some factors are not present in this “census of factors” question does not mean however that these factors are not understood. For instance, activity levels are considered to contribute to thermal comfort, as is seen from other answers such as the “air conditioners” (where it is the first explicative factor, proposed by 40.1% of the students, of power differences of the air conditioners to be installed in the three places described) but it is less mentioned by students in the final question. Speaking about activity levels it is interesting to report that students use different activity levels to explain age differences and they rarely consider age as a factor *per se*.
- Mechanisms of heat transfer are not well understood. Students very rarely use heat convention to explain differences between the two situations in the ‘convention’ question. The prevailing answer (76 per cent of the students) is that the situation in fig.b is not equally efficient because ice will melt and a considerable number among them add: “without cooling the water”! Convention is a complicated mechanism in any case. In fact, it can be agreed with Lienhart (1985:27) that it is not a separate mechanism:
  ‘There are two fundamental mechanisms of heat transfer- conduction and radiation- and by the turn of the 20th century, the 19th century physicists had reached a pretty solid understanding of both. But predicting heat convention is an analytical problem, not a scientific one - a matter of synthesising fluid mechanics and heat conduction’.

4. Discussion—Towards a teaching intervention
The findings concern a limited number of students. Especially those differences between the 11th and 12th (instructed) levels have to be reconsidered in the light of further research. Nevertheless, results show some clear tendencies which can provide the basis of a teaching intervention. If a constructivist teaching, which is aimed at, is to be built, student conceptions have to be considered seriously. Ideas registered through our work could help. Moreover the teacher must elicit prior knowledge in the
classroom. According to Baviskar et al. (2009) the first criterion characterising a constructivist teaching-necessary but not the only one-is “eliciting prior knowledge”. Some of the questions used in the questionnaire can help to highlight student ideas which can be the basis of classroom discussion and investigation.

This is how this teaching is planned, bearing in mind the previous work and findings:

- A short “brainstorming session” following the question: What comes to your mind when you hear the words ‘thermal comfort’?

Two elements: the dissymmetry of the idea of thermal comfort (enough heat in the winter but no reference to summer conditions) and the conception of air temperature as synonymous with thermal comfort are expected to surface easily. Both can be handled in an entire open class dialogue so that on one hand the symmetry (winter comfort-summer comfort) be established and on the other hand the exclusivity of air temperature be put in doubt.

- Work in small group sessions in order to register all possible factors that influence thermal comfort.

Work in groups facilitates the expression of multiple ideas by the participants (Gomatos, 1996). Besides, some hints distributed during group work in the form of questions or in the form of situation studies are judged necessary. In the plenary session following group work, students should arrive at results representing all the pieces of the thermal comfort puzzle, in other words to have a global qualitative representation of the factors contributing to thermal comfort.

- The final stage aims at stabilizing the factors and searching their quantitative contributions to thermal comfort. Group work would be adopted again, with the use of a software instrument called comfort calculator.

“Comfort calculator” is not a teaching instrument. It is a tool, in accordance with ISO 7730-1993 regulation, to predict Mean Vote on thermal satisfaction and PPD. Nevertheless it has many characteristics that make it applicable and useful in a teaching-learning situation.

![Comfort Calculator Screen](image)

**Figure 2.** Comfort calculator screen

In this software instrument all thermal comfort puzzle pieces are present and the user can play at setting different values to the various factors to see the overall result. This ‘play’ should be pre-organised to a certain degree by the teacher for example propose
a set of combinations of the values of the six factors and ask for predictions, then use the “comfort calculator” to verify and so on. This should lead to a semi-quantitative representation of the respective contributions of the six factors. Furthermore within the thermal comfort teaching intervention the teaching of heat transfer should be considered. Its place should be before the final stage. This teaching would have to objectives: The understanding of heat convention by observing convention currents and explaining various phenomena with convention currents and the representation of heat radiation in cases where there is not direct solar radiation or open fire radiation.

References
Enhanced Curriculum Planning for Gifted and Talented Ethnic Immigrant Students Using Serious Games.

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Abstract  
The educational environment is changing from traditional classroom teaching ecology from the adaptive individual/collaborative learning one by development of Internet, mobile and wireless technology. Therefore, we need to develop the new pedagogy in consideration of such new technologies. Especially, our knowledge and wisdom are cultivated by interactive learning/problem solving/building something through collaborative activities. In this paper, we would like to examine the meanings/ecology of "collaborative learning" again and explore the new technologies of communications which evokes and enhances it. Also, we aim to understand and share the concept of computer/Internet supported collaborative learning, and then we explore the technologies of collaborative tools and infrastructure to promote collaborative learning in consideration of the image of new e-pedagogy for collaborative learning. Teachers are now being told that e-Learning is way of the future. On the other hand, a lot of Universities offer a number of lessons using e-learning, m-learning and VLE’s (Virtual Learning Environments). Since, the invasion of digital technologies in classrooms three decades ago, many education providers has been streamlining their education philosophies. Further as new technologies allow for democracy in education for all, Information Communication technologies (ICTs) have become the enabler to ensure access to education. They encourage self-reliance and self-determination in terms of a learner’s ability to make progress within a demanding but incrementally staged environment, and help them to appreciate that the skills necessary for success in games such as problem solving and critical thinking can have relevance in other curricular areas and other social contexts such as study or work. They also create an implicit and explicit understanding that as a learner on our own we can be good but as a learner in a connected team we can be much better. As with rapid growth of the computer technology, E-learning systems usually require many hardware and software resources. This paper investigates a model of using games based learning as an essential element of an enhanced curriculum plan designed for the gifted students, focusing in these among ethnic immigrant minorities. The basic
concept for designing the system is developing the learning games network using
digital materials and Web 2 facilities, which is applied to the cloud learning platform
to attract the immigrant residents and assist them to achieve digital literacy across the
curriculum.

Keywords: serious games, enhanced curriculum, ICT technologies, gifted students,
simulation, collaborative learning.

1. Serious Games: Definition and scope

Serious games are designed for the purpose of solving a problem. Although serious
games can be entertaining, their main purpose is to investigate, or advertise.
Sometimes a game will deliberately sacrifice fun and entertainment in order to
achieve a desired progress by the player. Serious Games are computer and video
games that are intended to not only entertain users, but have additional purposes such
as education and training. They can be similar to educational games, but are primarily
focused on an audience outside of primary or secondary education. Serious Games
can be of any genre and many of them can be considered a kind of edutainment, but
the main goal of a serious game is not to entertain, though the potential of games to
engage is often an important aspect of the choice to use games as a teaching tool. A
serious game is usually a simulation which has the look and feel of a game, but is
actually a simulation of real-world events or processes. The main goal of a serious
game is usually to train or educate users, though it may have other purposes, such as
marketing or advertisement, while giving them an enjoyable experience. A serious
game is a game designed for a primary purpose other than pure entertainment.
Serious Games are interactive game based simulations of situations in which the
user/player takes an active part. The closer these scenarios are to reality, the more
valuable the experience is, as it can quickly be transferred into real business or life
situations. The information and sensations experienced remain strongly impressed,
allowing the players to refine their perception, attention and memory, so facilitating
changes in behaviour via so-called learning-by-doing. Gifted and talented students
have a higher capacity for learning than their peers. Because of this enhanced
academic ability, these students commonly are not challenged by the academic
activities presented to the general class. To ensure these students receive the
enrichment necessary to thrive, teachers can provide them with higher-level activities
that challenge and intrigue these highly skilled students.

1.2. Who Is The Gifted Learner?
The phrase gifted and talented student means a child or youth who performs at or
shows the potential for performing at a remarkably high level of accomplishment
when compared to others of the same age, experience, or environment and who:
- Exhibits high performance capability in an intellectual, creative, or artistic
  area;
- Possess an unusual capacity for leadership; or
- Excels in a specific academic field – (74th legislature of the State of Texas,
  Chapter 29, Subchapter d. Section 29).
Actually, identifying the gifted learner is not the problem. Properly educating and
providing experiences for the gifted learner is the problem. The highly gifted child
also must attend the regular classrooms, but instead of working at mentally
appropriate academic levels and having equal opportunity for learning, the gifted will
spend much of the school day tutoring others in cooperative learning groups or simply
going over curriculum that they master years ago. The traditional school does not meet their needs. Placed in a tutoring situation, the gifted child is allowed range of thought, encouraged to reach new levels, and search for better avenues of learning. His curiosity sated. And, more importantly, his desire to learn and master have been satisfied— all with the assurance of a guiding, master teacher.

**Figure 1**: The three-ring conception of giftedness. (*Reprinted with permission from Creative Learning Press*).

2. **Collaborative Learning Enhances Critical Thinking**

The concept of collaborative learning, the grouping and pairing of students for the purpose of achieving an academic goal has been widely researched and advocated throughout the professional literature. The term "collaborative learning" refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students are responsible for one another's learning as well as their own. Thus, the success of one student helps other students to be successful. Proponents of collaborative learning claim that the active exchange of ideas within small groups not only increases interest among the participants but also promotes critical thinking. According to Johnson and Johnson (1986), there is persuasive evidence that cooperative teams achieve at higher levels of thought and retain information longer than students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers (Totten, Sills, Digby, & Russ 1991). In spite of these advantages, most of the research studies on collaborative learning have been done at the primary and secondary levels. As yet, there is little empirical evidence on its effectiveness at the college level. However, the need for non-competitive, collaborative group work is emphasized in much of the higher education literature. Also, majority of the research in collaborative learning has been done in non-technical disciplines. The advances in technology and changes in the organizational infrastructure put an increased emphasis on teamwork within the workforce. Workers need to be able to think creatively, solve problems, and make decisions as a team. Therefore, the development and enhancement of critical-thinking skills through collaborative learning is one of the primary goals of technology education.

2.1. **Serious games and narrative learning environments**

Sternberg et. al. (2004) found that leadership expertise is bound to experience. In order to accelerate the development of leadership skills, then, it is argued that *experiential* and *narrative-based learning* (i.e., the use of story) should play a role to
begin to build a foundation of experiences in learners. This suggests interactive story-telling environments could play an important role in the next generation of leadership training tools. A particularly appropriate context for participating in narrative and practicing skills is provided by modern gaming environments. A relatively new area of research and commercial application, known as serious games, attempts to combine realistic simulations of real-world phenomena with the motivational and goal-based features of games.

Frequently, serious games are built with education and training goals in mind from the beginning (e.g., Raybourn, 2004). Unfortunately, there is a conspicuous absence of rigorous evaluations for learning in serious games, so it is not clear yet if expected learning gains are simply not being realized or if more research needs to be done. It is possible that serious games are suffering from the same problems that plagued discovery learning environments (Kirschner, et. al., 2006), and so the role of intelligent tutoring represents an important area of future research to provide the necessary guidance for learners. Several systems represent early attempts to merge these two technologies. Murray (2006) has integrated intelligent tutoring with tactical planning and mission execution, Core et. al. (2006) has built a tutor to support acquisition of interpersonal skills and cultural awareness, and finally, Johnson et. al. (2006) provides a coach for players of a 3d game that teaches conversational Arabic and cultural awareness.

2.2 Challenging Gifted Students in the Regular Classroom.

How do teachers develop an instructional plan that will be challenging, enlightening, and intriguing to students of different abilities, and still maintain a sense of community within the classroom? This is the central question for educators as they begin the quest of bringing sound instruction to gifted students in regular classroom settings. Research tells us that a large majority of gifted and talented students spend most of their day in regular classroom settings (Cox, Daniel, & Boston, 1985). Unfortunately, instruction in the regular classroom setting is generally not tailored to meet their unique needs (Archambault et al., 1993; Cox, Daniel, & Boston, 1985; Westberg, Archambault, Dobyns, & Salvin, 1993). This situation is putting gifted students at risk of failing to achieve their potential. Achievement scores below what might be expected from our brightest population provide the evidence (Callahan, 1990; Kantrowitz & Wingert, 1992; Ness & Latessa, 1979). The challenge for educators is twofold. Our gifted and talented population must have a full service education if we expect these students to thrive in the manner in which they are capable. Second, these students must be involved in educational experiences that are challenging and appropriate to their needs and achievement levels. The place to begin is in the regular classroom.

Table 1: Actions in a regular classroom

<table>
<thead>
<tr>
<th>What Are The Characteristics Of Students Who Are Gifted And Talented?</th>
<th>What Is The Role Of The Regular Classroom Teacher?</th>
<th>What Program Options Are Needed To Meet The Needs Of These Students?</th>
<th>What Instructional Provisions Must Be Made?</th>
</tr>
</thead>
<tbody>
<tr>
<td>First, gifted youngsters tend to get their work done quickly and may</td>
<td>Most teachers have, on occasion, had students in their classes who know</td>
<td>The heterogeneity of the gifted population leaves only one remedy</td>
<td>The teachers’ challenge is to identify student needs, develop and</td>
</tr>
</tbody>
</table>

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seek further assignments or direction. Second, they ask probing questions that tend to differ from their classmates in depth of understanding and frequency.

more than they do about some specific topics they are teaching.

that has any chance of succeeding over the long haul.

gain access to appropriate programs and curricula that correspond to those needs, and monitor student progress throughout the course of study.

In fact, these observations define the characteristics that challenge regular classroom teachers the most as they attempt to bring full instructional service to gifted and talented students. These students potentially differ from their classmates on three key dimensions (Maker, 1982): (1) the pace at which they learn; (2) the depth of their understanding; and (3) the interests that they hold. In order to develop instructional programs that will meet the needs of gifted students, as a facilitator, orchestrator, designer, or coach, the teacher presents the conditions for learning. He or she helps the student develop the skills necessary to learn, understand, and interpret an appropriately differentiated curriculum. This role requires teachers to have skills in both their subject areas (understanding its content, the manner in which its professionals think) and in the management of learning. Designing instructional opportunities for gifted students in regular classrooms finds its inspiration at the source of the concern—the students. The characteristics of these students lead to the instructional accommodations that are appropriate (The Association for Gifted, 1989). The accelerated pace at which gifted and talented students learn information requires that flexible pacing strategies (Daniel & Cox, 1988) such as skill grouping, curricular compacting, contracting, and credit by examination be integrated into classroom management formats. The need to explore topics in depth leads program planners to include provisions such as original research, independent studies or investigations, mentorships, or classes at another school or institution of higher learning. When addressing the unique or advanced interests of these students, planners might be inspired to include opportunities such as mini-courses, interest groups, clubs, science or art fairs, or internships.

**Figure 2:** The gifted cluster model
3. Cluster Classrooms
A cluster classroom is a regular mainstream classroom in which a small group or cluster of students with gifted identification are placed together. The classroom teacher has the skills necessary to meet the needs of gifted learners. The size of the cluster may be as few as two or as many as ten students. The rest of the cluster classroom is composed of students of varying ability, not everyone in a cluster classroom has gifted identification. Although experts in gifted education widely promote cluster grouping gifted students, little empirical evidence is available to attest to its effectiveness. This study is an example of comparative action research in the form of a quantitative case study that focused on the mandated cluster grouping practices for gifted students in an urban elementary school district. Some school administrators chose not to follow the model as designed, resulting in the emergence of two groups: gifted students in cluster-grouped classrooms and those in regular heterogeneous classrooms. Cluster grouping represents an inclusion model that allows identified gifted students to receive services on a daily basis with few financial implications to the district. In a gifted cluster model, all identified gifted students receive services, regardless of their area(s) of identification, ability level, achievement, or English language proficiency level. Identified gifted students are clustered into classrooms with a teacher who has been designated as the gifted cluster teacher for that grade. Careful balancing of the classes at each grade level and focused teacher training for the cluster teachers creates measurable differences in learning success. Differentiation of instruction lies at the heart of the gifted cluster model; therefore, evidence of the effectiveness of a cluster model must examine the achievement results of differentiated instruction occurring in the cluster classes.

4. Best Practices in Gifted and Talented Education
As teachers we have to find creative ways to stimulate thinking and create higher-order learning opportunities for all students. This is especially true for those with gifts and talents, who require modified programs and curricula. When a teacher has to face enhanced learning needs from immigrant students, usually bilingual, he must find alternative didactical approaches to do so. He has to assist these students built their own (online) learning environments. One common strategy for teaching students with gifts and talents is differentiating instruction, which can be accomplished through several methods, including curriculum compacting and enrichment. Curriculum compacting involves modifying the general education curriculum to meet the needs of high-ability students by assessing the work they already know and substituting or streamlining it, which results in more challenging content. Curriculum enrichment is a technique used to deepen students’ understanding of issues. Activities commonly found in the gifted and talented classroom include conceptual thematic units, questioning strategies, development centres, independent study, and mentorships. For years teachers have used computers to plan curriculum activities. Information technology is a particularly viable learning tool for gifted and talented learners. It can enhance and replace existing delivery methods and improve students’ overall education. The use of information technology to design an online or virtual learning environment that allows for enriched learning experiences and more advanced study for high-ability learners can be also used. It is a way to differentiate instruction by merging gifted and talented education and information technology.

4.1 Creating an Online Learning Environment
A Virtual Learning Environment (VLE) refers to a computer-based environment for delivering learning materials on the Internet. The main goal of the VLE is to create a thematic unit that integrates the curriculum with technology students enjoy using. Children of every ability level are motivated to create technology-enhanced projects using the Internet, online databases, scanned pictures and drawings, video clips, and hyperlinks. VLEs can be an exciting learning approach because of the unlimited amount of information available online. They may be used to develop cultural experiences in the visual, creative, and performing arts; allow for virtual visits to all types of museums, industries, government agencies, and institutions; expose students to different ideas through prominent or controversial persons; or provide advanced study in content areas that include research activities. You can implement a virtual thematic unit for your gifted and talented students as an independent study taught through designated sites on the Internet. It will require some initial effort; but in the long run it will engage them, allowing you precious time for other students.

- Creating Integrated Thematic Units
- Hyperlinks to Lessons
- Virtual Museum Tours
- Online Learning Games

Gifted and talented students enjoy stimulating and demanding activities. You can enhance your students’ learning with debates, storytelling, art, music, drama, and games. Online learning games are a fun way to challenge your students while reinforcing concepts from the unit. Examples of elaboration activities you can practice with kids include the following:

- Give each student a blank piece of paper along with pencils, crayons, or markers. Instruct them to draw a simple house by sketching a square with a triangle on top of it for the roof. Next, set a timer for five minutes. During the allotted time, students should add as many details to the picture as possible. At the end of the five minutes, share the pictures and talk about them. Encourage children to add more details as they see/hear the ideas of others that they like. The object is to make the pictures as elaborate as possible.

- Have a child or a small group of children help plan a party including invitations, decorations, games, food, and entertainment. Use everyday materials that are found around the house. The more detailed the decorations are, the better. This party can be for people, pets, or stuffed animals. It might be fun to have it theme oriented.

- Review classified ads and human interest stories with your young person. Look for ideas that evoke images. Take turns creating stories based on the mental images created from the ads. For example: “Lost—bag of pearls in blue velvet bag somewhere between Main Street and 7th Avenue after large dog grabbed it out of owner’s hand. If found, please call 644-5983.” What kind of story can be created using elements from this ad? What kind of a person would walk around with a bag of pearls? How did the person acquire the pearls? What was the person going to do with the pearls? Where did the dog take the pearls? The possibilities for a great story are endless.

5. Conclusion
Serious games are a rapidly growing industry. Military, corporate, education, and health care organizations from around the world are enjoying the positive effects that serious game implementations have had on their organization’s learning needs. Learning designers and game designers must collaborate fully for a game to provide...
the most engaging and effective learning experience. Incorporating aspects of social networking and other Web 2.0+ technologies into serious game design enhances learner-adoption by today’s workforce. Developing and deploying a serious game using industry-standard tools, will promote sweeping adoption by users. It is argued that digital games, including simulations and virtual worlds, have the potential to be an important teaching tool because they are interactive, engaging and immersive activities.

References


European Education in the modern era of technology

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The European Union is not just a reality of the future, it is the beginning for people to understand the dual form of their life, which originates from the common European foundation the states share and which is also the foundation the creation of the people’s life itself has based been on.

The sum of European practices make up the «European Culture» and the continuity of group life within the geographical area of Europe is characteristic. However, in modern times, there is an enormous moral lapse among the people of the West and a difficulty to accomplish their relationships, while at earlier times they cherished the same European collective values. The technological metamorphosis of the world, the mass means of transport and communication have contributed decisively towards the approach of people globally, in parallel to their moral distance.
The formation of the future European citizen is an original pedagogic plan of universal culture, which is being promoted thanks to a philosophically intelligent criticism of the National pedagogic systems existing in Europe. However, in the epicenter of philosophic meditation it is man, as a person in existence, who is the creator of his destiny and who has a firm will and responsibility. Much is made of the subjective individuality of action, liberty, communication, self-definition of the being within a world dominated by agony, terror, the conscience of death, desperation and sickness.

The being can be led to self-knowledge as long as Socrates’ philosophical tradition – on self-knowledge and ethics – consists the philosophical cornerstone. Thanks to self-knowledge the individual is guided to find ways to communicate with the fellow human being and towards fostering humanistic studies and the good arts. By applying the “Maieutics” method, dialectics and philosophic meditation, knowledge becomes a possession shared by the teacher and the student, the latter claiming to have conquered knowledge alone.

Therefore, the aim of modern European Education is not to create another human among many others, as an individual who does not become a person but a part of an impersonal machine, within the world. Modern European Education aims at individualism instead. With Moral Philosophy, students as beings are led to an authentic meditation process and to their ethical constitution, thanks to which they avoid mistakes and get better all the time and mature as personalities, thus contributing to a fair society and the strengthening of culture. Because the target of European Education, which is permeated by humanistic ideals and values, is not utilitarianism or the formation of people who accumulate knowledge to use in an epidermic way for profit. Thus, education within the European Union fosters the autonomous meditation and the love of man and being and the

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pedagogue searches for the therapeutic prescription that will heal the suffering Education System.

It goes without saying that the student can draw the maximum possible of happiness and advantage from his instruction without being led to isolation. For the being to live “in Truth” it means that there is an idea transcending itself and seeking communication with the other, just like in a love contest, bringing it close to the other, conserving its self and communicating with itself (while being open towards the other). Consequently, a kind of altruistic utilitarianism becomes a reality, one whose principle is the importance of personal happiness for the happiness of the collective group, according to the human condition.

The place where human nature evolves is the earthly environment that can also serve as ground for man’s civilization in the sense of acceptance of both one’s self “Me” and the other “You”. The similarity of “one’s self” to “the other” aspires after the realization of a dialogue between individuals at the level of conscience communication. It is at that time, that the thinking, conscious being fulfils itself, as a being educated at the principles of competition and the achievement of high grade goals-positions and distinction desired far from every moral inhibition.

According to Ovidio’s metamorphoses (III 342), the handsome young Beotian Narcisse, absorbed in the admiration of his perfect physical appearance on the river-banks, did not pay attention and did not respond to the love of the Nymph Echo and the result was the gradual fading of Echo’s voice to such a point that only the last syllables could be heard and Narcisse died

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admiring himself in the water of the river he had been using as a mirror. The myth
tells the tragedy of the loss of one’s self. Narcisse watches his reflection in the water
and falls in love with his handsome face. The reflection of his image deceives him
since it only shows his perfect face and not his internal world, the pain and his story.
This stage of the ecstatic magic of the being can be compared to depression. Narcisse
denied his true self and wanted to be just a good-looking young man. Having
abandoned himself to death, he transforms into a flower. Because death is the
consequence of the fixation to one’s Ego and the false self and nice and pleasant
feelings offer no depth to one’s being. Narcisse didn’t manage to love himself really,
he only loved his idealized image and as a result, he could not offer love to others
either.

In “The Fall” by Camus, the myth of Narcisse is projected to the person of the
judge Jean-Baptiste Clamence, a hero of modern times. The judge uses his wit to
make others like him turning to hypocrisy. Till an unknown woman falls in the waters
of the river Seine and he is not charitable enough to help her save herself. Nonetheless, this accident is the cause that will lead him to self-knowledge and the
ture love of self and the genuine love of the fellow human being, which can be
cherished via an education that can be distinguished by its humanistic approach rather
than a utilitarian approach or a vision of a world of self-isolation and in authenticity
instead.

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6 Albert Camus, «The Fall», Καστανιώτη Publications, (Nobel prize collection),
Translation by Karakitsou – Duze Nike, Kasabaloglou Roblain Maria, Athens, 2010,
p. 44.

7 Albert Camus, «The Fall», Καστανιώτη Publications, (Nobel prize collection),
Translation by Karakitsou – Duze Nike, Kasabaloglou Roblain Maria, Athens, 2010,
p. 84, 85, 86, 87, 89.
European Education is one that aims at equality, safety, freedom from discrimination among human beings, the fair and good, the protection of human rights within the European Union.

Besides, informatics, the technologies of information and communication, the telephone, the computer, the television and distance learning assisted by computers are important means of information transmission as long as the use of “the information society” is an educational tool adapted to the wishes of young audiences and formulate the modern type of the “man of the planet”. In this way, individuals socialize and education becomes individualized.

**Applied arts and design education in post WWII Greece: The institutions and their cultural and socioeconomic contribution**

Efrosyne Roupa, Historian of Applied Arts and Design

1. The development of Greek productivity
Following World War II applied arts9 flourished in Greece at an unprecedented growth rate at all levels of production, i.e. at the level of handcraft production (*heirotehnia - oikotehnia*), of small scale manufacturing partially aided by machinery (*viotehnia*), as well as at the level of industrial production (*viomihania*).

1.1 Handcraft production and the revival of Greek traditional crafts
At the level of handcraft production –only partially aided by simple tools (*heirotehnia*)- most crafts -Greek traditional or following foreign prototypes- were revived right after the war’s end. First and foremost, handcraft production did not require machinery and, thus, capital, which was scarce at that time and up until the 1950s. As it was the most flexible means of production, it could be applied with immediacy and cover people’s needs for goods that were destroyed during the war. In addition to it, a few years later, an interest for traditional Greek crafts emerged in the local market -by the Greek enlightened bourgeois9 and the tourists -, and, to a certain extent, in the foreign markets10 as well. The Greek bourgeois was filled with patriotic

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9 This paper is part from a broader study regarding the development of applied arts and design in Greece in the period between 1945 and 1967. The term applied arts refers to arts practised for the creation of articles decorative or functional, handcrafted or industrially produced, two dimensional (wall painting, graphic design), three dimensional (jewellery, textiles, furniture, car body construction, etc.) or in the form of services offered (interior decorator), of plain or elaborate aesthetics, that constitute the operating environment of the human being. In the past the term «decorative arts» was most often used, because the objects that were worth studying were those that had a distinct aesthetic appeal. Crafts, design, industrial design are subdivisions of the applied arts sector. Applied arts education is a subdivision of technical -vocational education.

9 See, for example, the interest for Greek, traditional textiles in the article «Ta heiropoieta yfanta choun tin prototypia tous [Manually weaved textiles can be distinct]», *Tahydromos*, no. 186, 2 November 1957, 27-28.

10 K. M. Souliotis, «Ti mparei na mas apodosi he heirotehnia an organothi he paragogi kai he exagogi ton proeonton tis [What handcraft could give us in return should the production and exportation of its products be organized]», *Paragoghikotis*, no. 19 (1957): 27-29.
emotions caused by the war and the rapidly changing world. The foreign visitors and the foreign markets, most of them from industrially developed countries that had entered the atomic age, wanted, through the handcrafted object, to recapture their lost innocence. Handcrafted items were among the few goods Greece could export to the international market, which was flooded with industrial products. The demand for handcrafted products and the revival of the traditional crafts were enthusiastically welcomed by various groups -the State, the small workshops, as well as the charitable organizations-, as the easiest and fastest solution to the country’s unemployment and productivity problems. Initially, it was thought that it would provide with a job the thousands of young people from the provinces who lacked vocational skills and had low educational background. With time, they were further appreciated as a means for agrarian populations, which were out of work during certain seasons in a year, to earn an extra income (oikotēhnia).11

The advancement of industrial production and urbanization in the following years, in the 1960s and 1970s, did not overshadow crafts. On the contrary, crafts, and in particular, Greek traditional, were idealized as endangered artful, creative production, which should be preserved. In such a milieu bookbinding, woodcarving, art pottery, textile weaving and embroidery flourished in Greece. In addition, since the end of the 1950s, foreign crafts, such as batik textile printing, were also practiced.

1.2 Small scale manufacturing partially aided by machinery

In the postwar period, the tendency was, whenever possible, for tools, machinery and modern technology to take precedence over manual work with the aim to improve quality or maximize productivity. A characteristic example is the transition from the tailor-made dress (sur mesure) to the ready made (prêt a porter), which required new cutting and sewing techniques and machinery. In the aforementioned clothing sector, within one year, in 1954, 95 new manufacturing companies were founded.12 Jewelry and pottery had also entered the manufacturing era. Craft workshops and small scale manufacturing were the backbone of Greek economy. Around 1960-1961 there were approximately 90.600 people employed in sartorial crafts - including the sewing of fur coats-, 58.300 in wood processing and furniture construction, 50.400 in textiles, 37.200 in leather processing and shoe making, and 4.000 potters, while 32.400 worked as technicians or workers in industry and manufacturing.13

1.3 Industrial production

At the other end of the spectrum laid the country’s industrial development. As early as the 1950s, when production had just started to pick up, a great variety of products were produced in Greece, some of them for the first time. There were industries14 which processed metals to manufacture cans -for the food sector-, tubes -for the drug

11 «Ena shedion dia tin viotehnian kai tin oikotēhνian en syndyasmο me tin hrisimopoiesin argouson ergatikon heiron [A plan for manufacturing and home handcraft production in combination with the use of idle hands]», Paragogikotis, no. 3 (July-September 1954): 50-51.
14 Sideris, passim.
and beauty sectors-, cooking utensils (Afentakis, Halkida), heating appliances (Thermis, S.A. and Izola, S.A.), enameled bathroom appliances (K. Kostas, island of Kea, and Izola), electrical appliances (Izola), as well as car bodies. There were also numerous yarn and textile manufacturers (the biggest one among them being Piraiki – Patraiki), which processed natural or synthetic materials to manufacture various goods for people’s clothing as well as for various professional and recreational uses. In the field of pottery, there were, in Athens alone, ten big factories producing white ceramic ware for functional and decorative purposes (the biggest one among them being Kerameikos). Tile and ceramic bathroom appliances were also about to be developed. Again, in the country’s capital, there were industries producing plastics (10), glass objects (4), furniture (8), a variety of printed matter (36), ready to wear clothes (2), shoes, hats, buttons and many other.

2. The need for higher standards in Greek production
Greek products had to compete against the foreign ones at the local, as well as, at the international market. Competition was expected to intensify after the country’s participation in E.E.C., a much envisioned development during the end of the 1950s, which in 1961 culminated into the Association Agreement. However, Greek products, when compared to the European ones, were considered inferior, even by Greeks themselves. According to the scholar Theophylaktos Papaconstantinou «the painful experience Greeks encounter when using Greek products make them turn to the foreign ones».

Following World War II technology advanced rapidly and humanity started anew from bottom zero taking advantage the potentials offered by technological developments. Information about international achievements was pouring into Greece through various international educational exchange and business collaboration programs and the joint ventures that were formed. Since access to knowledge had become easier than in the past, it was felt that Greece should not miss such an opportunity to make up for the lost time. Under such circumstances a number of improvements had to be accomplished on production methods and other issues related to the product’s quality.


16 We present here examples of financial and technological aid that was provided to the country through the Marshall Plan: Two Schools, Sevastopouleios and Sivitanideios updated their workshops’ technology through the American aid. For Sevastopouleios see Eleftheria, 2 September 1950, p. 3. For Sivitanideios Aliki Vaxevanoglou, Sivitanideios Shole Tehnon kai Epaghalmaton [Sivitanideios School of Crafts and Vocations], Sivitanideios Public School (Athens, 2005), 153-163. Also, EL.KE.PA was established (1954) to introduce to the country methods which would increase and improve productivity. The organization published the magazine Paragoghikotis (1954), conducted studies, organized lectures, film presentations and educational seminars. It should be noted that such information was not limited to businessmen but was widely disseminated to the public as well. See for example a translated into Greek article by P. Cendron, «O thriamvos tou ‘Amerikanikou’ aftomatismou [The triumph of American automation]», Eleftheria, 12 August 1956, p. 3-4.

17 The car industry, which so far is the only one from the manufacturing sector that has been thoroughly studied regarding post war Greek production, provides us with ample material on technology introduced to the country through joint ventures. For example, the Wayne car body assembly system was applied by the Tagkalakis Co. as early as 1947. The following years, two companies, BIO (1956) and BIAMAX (1958), applied the Mercedes technology. Efrosyne Roupa, E. Hekimoglou, «He historia tou aftokinitou stin Hellada, emporio kai paragoghi sti megheni tou kratous 1894-1986 [The history of the car in Greece, trade and production under the state’s clamp 1894-1986]» (Athens: Economia, 2009), 270, 401, 435.
Greek production, in order to become competitive, should apply cost effective productivity methods, raise the quality of its products and align with contemporary international production and trade regulations. Such a development involved the use of new technology—whether tools, machinery or raw materials and techniques—as well as taking care of issues such as standardization, durability, functionality and, even, aesthetics. American marketing methods became predominant.

This new entrepreneurial attitude that, for a brief time, at least, had influenced not only Greek businessmen but the State as well, is reflected on the organizations that were founded, such as EL.KE.PA. (Center for Greek Productivity, 1953), E.O.E.H. (National Organization of Hellenic Handicraft, 1958), the Etaireia Ellinikon Spoudon (Society for Greek Studies, 1954), as well as the magazines they published, such as Dimosiotis kai provoli (Publicity and Promotion, 1958-1988), Hellenika themata (Greek Issues, 1961-1972, published by the Society for Greek Studies), Paragoghikotis (Productivity, 1963-68, published by EL.KE.PA) and other.

3. The importance of the appealing image
The semiotics of the appealing image, were always highly esteemed in Greek society. In post war Greece improving one’s appearance and living environment, and thus one’s social status, became of meager importance. The power of the appealing image grew bigger as the consuming power of the middle class increased. According to the National Statistical Service (N.S.S.G.) following World War II there is a continuous increase of consumption in the country. The highest level (17%) is reported during the years 1963-1964 and the lowest (5%) during 1967-1968. This increase was due to a number of different macroeconomic factors, such as the improvement of the income for a large part of the Greek population- within one generation G.N.P. was tripled-, the stability of currency, the low inflation and other.

18 When researching the archives of Piraiki-Patraiki cotton industry, one is impressed by the company managers’ continuous efforts to upgrade its technology. See the Piraiki-Patraiki archives in Piraeus Bank Group Cultural Foundation: «Memorandum», written by D.F. McCauley, director CIT, on 1.11.1954, A3S6Y3/93214/7, p. 15. Also «Syneheia tehnikou elaghou epi tou kostous tou ergou tis A.E. Piraikis-Patraikis [Sequence of technical control reports regarding the cost of the project by Piraiki-Patraiki Ltd.],» conducted by K. Philippopoulos for O.H.O.A. [Economic Development Financing Organisation] on 17.3.1962 in A3S6Y3/P33263/11, p. 16-17. Each upgrading meant that technicians and workers should have the educational background to adjust to new machinery.

19 Th. Papaconstantinou. Also, see the lecture given at the Thessaloniki Chamber of Commerce and Industry by Robert Bartels, an expert on marketing matters, who visited Greece as an envoy of the Fullbright Foundation. R. Bartels, «He tehniki tis emporias dia tin afixisin tis paragoghikotitas [Marketing applied to increase productivity] », Paragoghikotis, no. 7 (February 1955): 51-53.

20 See footnote 8.

21 Efrosyne Roupa, «Mia proti proseghisi tis istorias tis katanalosis eponymon proionton, design kai life-style stin Athena tou 19ou aiona» [An introduction to the history of consumption of brand name products, design and lifestyle in Athens during the 19th century], in «The Everyday», IX International Semiotics Conference, 5-7 November 2010, Hellenic Semiotics Society, University of Cyprus, Nicosia, Cyprus. To be printed.

Increased consumption was also the result of new values and habits that prevailed in post-war Greece. Towards the end of the 1950s, as Greece was at the threshold of the age of plentitude, the socially accepted standard of consumption was raised. Materialism was dignified in the name of science, technology and progress. The ideals of post-war society were to apply science and technology to harvest earth resources, to get rid of poverty, help the needy, raise living standards and provide quality of life for all, thus securing peace. Humankind should progress with the aims of achieving «more» and faring «better».

Progress was identified with consumption, and thus with production, which, in turn, was identified with sales. Sales were identified with the product’s appealing image. At the core of the American marketing methods and consumption values that disseminated in postwar Greek society, there was the design of the object’s appealing image and the creation of, equally appealing, means for its promotion to the consumer. According to a Greek businessman (1958) «if one is aiming at the development of production, and in particular at ‘line production’ [i.e. industrial, mass production] shouldn’t he take all necessary measures to assure that there will be an analogous [continuous] mass consumption?». Not only the design of the product’s aesthetics became important, but of its packaging, its display as well as its advertising.

One should not underestimate society’s need for beautification, a sign of quality of life, after the horrors of war. In 1959 the Vakalo School initiated annual contests for the best decorated window shop in Athens («The Window Shop Week», 1959-1961). True indeed the aim was to stimulate registrations by presenting the school’s successful educational program via the students’ work. However, the idea was met with such enthusiasm that it was picked up by Helene Lampraki-Savidou, publisher of the general interest magazine *Tahydromos* and a patron of culture along with her husband George P. Savides. In the 1960s, Savidou organized numerous design contests, particularly pertaining to the decoration of window shops and to the design of posters and wrapping papers. Through the magazine, these contests reached not only Athens but Thessaloniki and the entire country as well. The contest’s committee stated that the aim was to promote all things beautiful, to raise aesthetic standards in Greek society, to unite aesthetics and artists with commerce and to educate merchants on how to increase profits.

The Vakalo School’s administrators pointed out the importance of design in the fight Greek products were giving to attract consumers. Because consumption is an impulsive and emotional reaction «it is nowadays common knowledge that between two products of the same type, the one with better aesthetics will prevail in the market».

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23 Ath. Papakonstantinou, *He epaghelematiki ekpaidefsis* [Vocational education], 18-20.


27 From a press conference, on the occasion of the annual exhibition of the students’ progress, ca. 1970. I would like to thank Vakalo School for allowing me to study material from their archives.
Finally, quality standards in production, particularly when design had also been taken into consideration, were perceived as testaments of civilization. The art critic Efi Ferentinou, on the occasion of the first graphic design exhibition in Athens (Gallery Zygos, 1958), praised the importance of the «civilized printed material for [its precious contribution] to Greek people’s cultural uplift and the country’s promotion abroad».  

4. The development of applied arts education

Greek production, in order to secure its position in the local market and find a place in the foreign market, had to develop according to international standards. To do so it required craftsmen and technicians, as well as designers skilled to handle the aforementioned developments. In the words by Dr. Athanasios Papakonstantinou, consultant to Pedagogical Institute: «This century is the century of material progress, which can only be achieved by technical vocations. … Technical vocations are the cause, and at the same time the effect, of progress».  

What was the background on which applied arts education developed in post war Greece? During the 19th century crafts were transmitted from one generation to the other in traditional ways, from a parent to the offspring or from a master to the apprentice. When this pattern of knowledge transmission was not possible, the void was filled by institutions such as orphanages –for example the Hadjikonsta Orphanage (est. 1853), the G. Stavrou Orphanage (Ioannina, 1887) and the Papafeion Orphanage (Thessaloniki, 1903). Skills on new or advanced technologies, such as the use of machinery, were taught at the School of Arts (est. 1836), the first technical – vocational school in the country, which eventually evolved into National Metsovian Polytechnic (1914). 

Applied arts’ education as a part of technical – vocational schools emerged early in the 20th century (Sevastopouleios, est. 1907, oper. 1909 and Diplareios, est.1894, oper. 1916). Initially those schools prepared students for furniture construction, sartorial arts, shoe making and metalsmithing. As we progress into Midwar period, new technologies –by now even more related to sciences, such as engineering, electricity, physics and chemistry, which could not be taught in traditional ways-, gained ground. Such developments in technical education, in addition to social and economic changes as well, forced applied arts programs to expand to new directions. In the 1930s we know of at least two schools, Sivitanideios and the public school Papastrateios (both established in 1929), which offered courses on, as they were back

then called, «decorative arts».

Nevertheless, despite all developments, prior to World War II, the traditional ways of knowledge transmission, and in particular, the system of apprenticeship, prevailed in the field of applied arts. Following World War II technical education acquired new importance for two reasons. First, the traditional transmission of knowledge was interrupted during the war and, particularly, during the civil war. In the following years it received the final blow by urbanization. Second, in the postwar period, in most sectors, the way things were done had been either improved or, simply, changed. Industry and manufacturing required skills on new tools, machinery, techniques and raw materials. Even Greek traditional crafts had to be altered.

According to the new, postwar standards, training was deemed necessary to improve technicians’ dexterity -either in handcraft or in industrial production-, and bring their skills up to date with the latest international developments and methods. In particular, the job market demanded: 1. Craftsmen for handicraft production, skilled, primarily, in Greek traditional crafts but also on contemporary urban (crafts that had been influenced by foreign developments). 2. Technicians for manufacturing and industry, skilled to work with new tools and machinery. 3. Lastly, designers -skilled in new materials, techniques, technology as well as aesthetics-, to work for various sectors pertaining to life style services and production.

4.1 Technical schools to cover the demand for skilled craftsmen and technicians

Under such circumstances technical – vocational schools became once again a necessity. Prewar institutions started anew – such as, Sevastopouleios, Diplareios, Spiti tis Gynaikas (The Woman’s House, YWCA, founded in 1923), Vallianeios (Lexouri, island of Kefalonia, est. 1926), Sivitanideios, Papastrateios, Euclides (Thessaloniki, est. 1934) and Helleniko Spiti [tou koritsiou] (Greek [Girl’s] House, established in 1938 and administered by Ag衔iki Hadjimihali)-, while a remarkable number of new schools was established. In 1951, it was estimated that there were, approximately, 60 technical schools. In 1957, according to the first official postwar
survey conducted by N.S.S.G., there were 159 technical schools and 24 home economic schools with 30,589 and 2,840 students respectively.\textsuperscript{37} By the end of the 1950s technical education seemed to have gained the reputation that was long due to it. Books and articles pertaining to career choices, a popular subject in postwar era, advised young people to choose technical education over the general one, as a secured career and income bearing choice.\textsuperscript{38} In 1965 there were 216 technical schools and 15 home economic schools with 65,371 and 1,491 students respectively.\textsuperscript{39} Most schools were located in Athens, the country’s economy center.\textsuperscript{40} As early as the end of the 1940s a number of schools were established by benefactors and charitable organizations. Among them the most renowned were the schools established by Vasiliki Pronoia (The Royal Welfare Foundation, 1947), where teenagers were taught carpentry, shoe-making, metalsmithing, printing and sewing.\textsuperscript{41} Even well into the 1970s crafts continued to be taught at orphanages and other social institutions. In such schools, upon graduation, students received as a farewell gift the tools with which to practice their craft and start their career. Businessmen associations also remained a contributing force, most probably in an effort to cover their intense need for skilled technicians. The S.K.Y.P. (Panhellenios Shole Klostikes, Yfantourghikes, Plektikes [Panhellenic School for Yarns, Textiles and Knitting]) was such a school established in 1943 by the Panhellenic Association of Yarn and Textile Industries.\textsuperscript{42}


\textsuperscript{38} «Ohi oloi sto gymnasio [Not everybody should attend high school]», \textit{Tahydromos}, no. 438, 1 September 1962, 22-23.


\textsuperscript{40} In 1965, 91 out of 216 technical schools operated in Athens. \textit{Statistiki tes ekpaithefseos 1965-66} [Statistics on education 1965-66], 8.

\textsuperscript{41} \textit{Technika hronika}, no. 327-328, (September-October 1951): 331. Two more organizations may serve as examples of similar charitable activity. In 1948 the international organization ORT established in Athens and Thessaloniki a school for students of Jewish religion. Among the various courses it offered there were courses on cutting and sewing and technical drawing. M. Molho, \textit{In Memoriam} (Thessaloniki, 1949, reprint 1976), 358. «ORT and the displaced person camp: Greece», \textit{http://dpcamps.ort.org/camps/greece/} (accessed on 26.3.2012). Around 1949 there was also the school founded by Roverianos Omilos Hellathos (The Rovers Club of Greece, ca.1949), which offered courses in decorative arts, such as cutting and sewing for dress making, various engraving techniques (fire-etching, woodcarving et. al.), metalsmithing and drafting. Only girls from poor families, daughters and sisters of those who served the country during the war, and in particular of those who died in action, or police officers’ siblings, were eligible to register for the courses. \textit{Eleftheria}, 16 December 1949, p. 2.

\textsuperscript{42} Among the postwar benefactors that will emerge, Stamoules Stratos (1871-1963) will be a leading figure. The founder of Piraiki-Patraiaki cotton industry, along with Christopher Katsampas, contributed to the establishment of S.K.Y.P., and served as the president for S.K.Y.P. and Sivitanideos as well. His son Christopher Stratos was the president of Etaireia Ellinikon Spoudon, an organization which also believed that the country’s reconstruction could be achieved by the dissemination of knowledge, hence the publication of magazine \textit{Hellenika themata}. For the Stratos and Katsampa families entrepreneurial philosophy see also the bibliography in notes 11 and 26.
Applied arts formed a small part of the sum total programs that were offered on technical-vocational educational. The most popular applied arts programs were those pertaining to sartorial arts and the related crafts. These were taught at home economic schools as well as schools for sartorial arts. Such programs were the most numerous and among the first ones to be established soon after the war. The most renowned among them, primarily for traditional crafts –tapestry, embroidery at al.-, were the schools of Vasiliki Pronoia (The Royal Welfare Foundation), the Helleniko Spiti [tou koritsiou] (Greek [Girl’s] House) and the Spiti tis Gynaikas (The Woman’s House). A large number of private schools offered courses on cutting and sewing women’s and men’s dresses -following European and American methods-, underwear and other linen, which was used in the house. Skills for the burgeoning textile and knitting industries were taught at S.K.Y.P, at Euclides, at the privately owned and operated school P.A.L.M.E.R., at Vallianeios, et. al. Crafts related to carpentry and furniture manufacturing, were also very popular. They were taught at Sevastopouleio School at Diplareios, at Sivitanideios, at Vallianeios (Lexouri, island of Kefalonia), at Vernathaki (island of Mythen), at Euclides, at schools that had been founded at Volos and Herakleion (island of Crete) by each city’s local Chamber of Commerce and Industry, as well as orphanages, such as Papafeio Orphanage (Thessaloniki) and G. Stavros Orphanage (Ioannina).

A major step in technical education was the establishment of the Kratikes Tehnikes Sholes Matheitias (State Technical Schools of Apprenticeship) in 1952. These were founded by the State in cooperation with associations which represented various sectors of Greek production. The educational programs were organized according to each sector’s needs. The apprentices were trained in a company, during the day, a job for which they received a minimum salary, and attended theory classes during the...
evening. In the 1960s courses were offered on silversmithing, goldsmithing, pottery – in cooperation with the Amarousi Potters’ Association and E.O.E.H., on car body construction, cutting and sewing female or male dresses, fur processing - in cooperation with Kastoria Fur Association-, et. al. As the program adjusted to the job market’s needs, new courses were scheduled upon an associations’ request. By mid 1960s the craft of watch making was also offered.

The aforementioned list of institutions and educational programs is only indicative and by no means complete. For example, for some period, the art of silversmithing was also taught at Greek [Girl’s] House, at various workshops that cooperated with E.O.E.H. after its foundation in 1958, as well as at schools that were organized by local associations, such as by the silversmiths of the city of Ioannina. Typography was taught at the School of Typography, established in 1952 by the National Printing House, as well as at several schools established by the Royal Welfare Foundation, such as at the island of Leros.

Since those were times of transition, when handcraft and industrial production coexisted, schools often offered courses for both methods. Furniture manufacturing offers us an example of how, in some schools, traditional crafts were taught along with mechanical technology. For example, in Thessaloniki, the Papafeio Orphanage, where, since the beginning of the century, furniture manufacturing and wood carving was taught to the orphans, had reached an agreement with Euclides technical school whose workshops were equipped with the latest in machinery. This way, the students were taught traditional techniques, i.e. woodcarving, at one institution and machinery skills at the other. Likewise at the Vallianeios textile school the students were taught to handle both traditional as well as power looms.

In an effort to cover their need for specialized technicians, it was also customary for associations and industries to form, sometimes even at their premises, their own short term specialization training programs. For example, EL.KE.PA’s three months program on silversmithing and goldsmithing (1958), or BIAMAX’s (1962) training on interior car body parts’ construction and assembly, were regarded as specialty programs for technicians who already had certain skills.

Finally, we should also note the importance of drafting among the various skills craftsmen and technicians should have. Drafting cultivates the habits of neatness and accuracy and stimulates the powers of imagination and invention. It allows technicians to adjust to changes in production as well as to generate improvements and communicate these to others. Its importance was established during the Midwar period, yet, as it continued to grow, post war schools not only offered courses on several types of technical drawing, such as architectural, mechanical, textile drawing

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55 The one year program offered courses on the system of linotype, of monotype and other. Law 2065/1952.

56 Roupa, «To epiplopoieio tou Papafeiou Orfanotrofeiou [The Papafeion Orphanage furniture workshop]».

57 I would like to thank Spyridon Kouloumpakis for the information.

58 For EL.KE.PA. see «He shole metekpaidefseos hrysohoon kai argyrohoon [School for the post-training of silversmiths and goldsmiths]», Paragogikotes, no. 27 (March 1958): 201. For BIAMAX see the company’s job announcement in Eleftheria, 5 January 1962, p. 5. See also «Sholai tehnikis katartiseos en Helladi [Schools for technical vocations in Greece]», Paragogikotes, no. 14 (September – October 1956): 11.
(yfantourghiko shedio)\textsuperscript{59} or decorative drawing –the last one used in certain sartorial arts-, but also a major for students to specialize in, after a one year long attendance. At the end of the 1950s at least five schools in Athens offered drafting as a major.\textsuperscript{60} Crafts and technical skills for their mechanical production were taught at the secondary educational level. Around 1957, at the Athens School of Fine Arts (A.S.K.T.), several courses, such as woodcarving, book printing, illumination and lithography, were offered at the country’s highest education level. In 1961 the program was reformed and seven workshops were established. Among them were included the crafts of pottery, book printing, and mosaic.\textsuperscript{61}

4.2 Workshops of Liberal Arts for the new urban applied arts and design professions

Beginning in the second half of the 1950s a larger, than ever before, number of applied arts’ and design professions -such as the product designer, the industrial designer, the graphic designer, the fashion designer and the interior decorator - were conquering new grounds in Greece. By the mid 1960s these professions had acquired a, hitherto unforeseen, glamour in Greek society.

A certain aura of glamour and prestige were given to design professions, by the fact that a number of aspiring Greek designers had studied in a related field abroad and upon returning to the country brought with them news regarding the latest developments.\textsuperscript{62} Design professions were also promoted by the period’s cultural elite which consisted from learned men and artists and was supported by enlightened entrepreneurs. The post war cultural elite gathered around nuclei such as Frantzis Frantziskakis, publisher of the art magazine Zygos and owner of gallery Zygos, Antonis Kitsikis, publisher of the architecture magazine Arhitektoniki, by general interest magazines, such as Tahydromos, published by Helen Savvidou, as well as the schools that were established and which are mentioned further below.

A characteristic example of the developments is the film «Amfivolies» («Doubts») directed by Gregory Gregoriou in 1964. In this film noire the script writers Gregoriou and Yiannis Maris gave to Jeannette (Kaiti Papanika) the profession of the fashion and shoe designer. One could argue that the script writers were influenced by Hitchcock’s movie «North by Northwest» (1959, in Greece «Sti skia ton tessaron giganton», 1960) in which Eve Kendall (Eva Marie Saint) was an industrial designer. Yet, we should not oversee the fact that dress and shoe manufacturing were two of the most promising sectors in post war Greek economy with frequent reports and advertisements in the press regarding their achievements. In 1966 the magazine \textit{Eikones}, in an article regarding the future’s most promising professions, included among others the profession of the architect, of the industrial designer and of the advertiser.\textsuperscript{63}

\textsuperscript{59} Course offered at S.K.Y.P. For this information I would like to thank Leonidas Nazos, a graduate of S.K.Y.P. in the late 1940s and a share holder of the Tegopoulos cotton industry.

\textsuperscript{60} K. D. Georgoule, \textit{Epaghelma kai epaghelmatiki ekpaidefsi} [Vocation and vocational education] (Athens, 1958), 12.

\textsuperscript{61} «Ai eisagoghikai exetaseis tis Sholis Kalon Tehnon [Entrance exams for the School of Fine Arts]», \textit{Eleftheria}, 6 July 1963, p. 2.


\textsuperscript{63} «Ta kalytera epaghelmata sta deka prosehi hronia [The best professions in the next ten years]» \textit{Eikones}, no. 577, 11 November 1966, 84-86.
The year 1958 marks a turning point for the development of applied arts and design in Greece. That year E.S.K.T. (Liberal School of Fines Arts or else known as Vakalo School) was established by the artist and scenographer George Vakalo, the art critic Helen Vakalo, the artist Panayiotis Tetsis and by Frantzis Frantzisakis. Upon graduation, the Schools’ students could work as interior decorators, graphic designers, textile designers, fashion designers, furniture designers and scenographers. Vakalo School was the first in the country to offer an educational program on urban applied arts and design. Moreover, one of the School’s novelties is that in mid 1960s it introduced to the country’s future designers the Bauhaus design theory with the course «Basic Design», which was taught by Niki Kanaghini. 64 Vakalo School paved the way for the establishment of similar schools in Greece during the following years. The following academic year, in October of 1959, two more schools followed Vakalo’s path. One of them was A.T.I. (Athens Technological Institute or Doxiadis Schools), which, since 1958, offered courses on drafting and other skills related to building. The Doxiadis Schools not only echoed Constantinos Doxiadis’ visions about reconstructing a modern and highly developed Greece, but it was also administered by the scholar Evangelos P. Papanoutsos.

In the 1960s numerous other schools were established. 66 Besides Vakalo and A.T.I. the next most renowned school was the Kentro Tehnologikon Efarmogon (Center for Technological Applications), administered by Niko Em. Papadakis, a major figure in Greek applied arts, along with his wife, the ceramist Helen Vernadakis (Athens Design Center). During the academic year 1964-65 even the publishers of the architectural magazine Arhitektoniki attempted for a brief period to establish a school offering courses on interior decoration, advertising, graphic design, and scenography. 67 In addition, some vocational schools, such as «Euclides» (Thessaloniki), extended their programs to include courses on interior decoration. 68 Likewise, in many cases the old «home economics»or «sewing and cutting» schools had changed their name to «schools for modelists» or «school for designing and cutting». 69 True indeed there were not many career opportunities for designers in Greece. Those who had chosen such a career path were giving a fight to educate Greek society about the services they offered and to protect their intellectual property rights. For example,


65 The other school was the International Educational Institute of Greece. It was one of the most ambitious, yet short lived, institutions. It was founded by the General Confederation of businessmen – Manufacturers of Greece and was administered by the Greek American Educational Institute. It offered courses on textiles, fashion design, photography, folk art, graphic design, packaging, drafting, metalsmithing, house handcrafts and interior decoration. Eleftheria, 29 September 1959, p. 5.

66 There were also the Ekpaideftikon Kentron Nikis, the K. Zaharake School, the Klimens Schools (by E. Kleiamakis), the Polyklettos School (by G. Stamatiou), EKDES (by G. Drosos) and Dimitrellis School –this last one in Thessaloniki. Eleftheria, 17 September 1966, p.6.

67 Announced in magazine Arhitektoniki, no. 47 (September-October 1964): 82-83.


Greek industrialists, in most cases, hesitated to employ a product designer. Only a few big companies, among them Izola, Peiraiki – Patraiki and Kerameikos, are known to have had art departments. To which extent the design these companies applied was acquired from abroad, it was used *immotum*, it was modified, or it was genuinely created in those art departments, is a subject still under research. Designers who worked in the sectors of fashion design, graphic design and interior decoration, overall fared better.70
Unlike other vocational choices, design professions were the preferred career choice for upper middle class young adults. The development of education on these new professions was not instigated by the State but by the private sector. The schools were considered liberal arts workshops and the students who enrolled had already completed secondary education. This part of applied arts, which focused primarily on design, was paving its own path, independently from technical education.

**Utilization of technology and computer communications in education and culture**

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**Abstract**
The present work/study investigates the usage of informatics in training as well as in education.
In the beginning a brief chronology for communication technologies and digital devices from the 60s till today is given.
A more detailed report on the introduction of new technologies in education follows, highlighting the significant contribution of teacher with new educational methods and software.
A few statistics are given, concerning the age, the gender and distance learning, which in a similar way contributes in the evolution of digital communication.
Finally, the disadvantages and advantages of educational applications are mentioned.

**Introduction**
The term educational technology is used to describe the rational establishment and usage of one or more technologies in order to acquire an educational result. The term also characterizes the consideration, the values and the alleged or actual results that correspond to these practices. [1]

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70 The order with which the professions are mentioned here reflects the degree of success they were met with - from the first/best to the last -.
We all have realized that we live in the age when technology has invaded in all the sectors of science and every other productive activity, contributing in this way to an inconceivable evolution.

Education could not and should not remain unaffected, apathetic and detached to this new reality for two main reasons;

First because the character of education should be adaptable to the specific requirements of society and secondly because education can very well employ the computer itself, integrating it in a mechanism, either as a teaching tool, or as a mean of communication, upgrading in this way the quality of learning procedure.

**Chronology**

The use of digital technology on education began at advanced countries since the 60s. In our country it was not before the 90s that the first computers appeared at schools. We can divide the history of educational software in three periods. CD-ROM of the 90s describe the first period of educational software. Then the second period followed, with software that cooperates with the appropriate devices and is open regarding its content. In the third period, that we are living today, the software mostly exists in the form of web service and disposes more communicative characteristics.

Briefly, there are two categories of technological innovations that affect the entire education:

(a) Communication technologies, with most notably the internet and web, offer new, advanced methods for searching and managing information and knowledge, while at the same time they have altered the way that people communicate, opening new communication paths, opinion exchange and osmosis.

(b) Digital devices become smaller, their software becomes more intuitive and efficient, their operating environment more friendly. [2]

**Introduction of new technologies in Greece**

What is may not deeply realized, mainly in Greece, is the importance of new technologies in education of high quality, which is a precondition for every form of development in a country. [3]

Certainly, computers have dynamically invaded to Greek education the last ten years, since each school unit is equipped with computing laboratory that enables children and teachers to use them. Most of these labs now have broadband connection in the internet, while the Pedagogical Institute equips them with specific educational software that permits further utilization of computers in the main educational procedure.

The rate of utilization of new technologies is steadily growing, since more and more schools, universities e.t.c. are equipped with cutting-edge technology (mainly interactive whiteboards), that allow teachers to test their usage in real conditions. Unfortunately we are still at the beginning, and the rate of utilization of this technology remains low. However, we are certain this is going to change soon.

The advantage of these technologies is their very low cost and their amazing communication capabilities. Even if their usage in educational procedure itself is delayed, teachers can use these services for their assistance (e.g. searching educational material). In the last years, an informal dialogue is initiated, concerning the utilization of computers and communication tools in education. This matter has many dimensions and can be seen from many different aspects. [4]
The role of teacher

The position of teacher in computing and digital media handling capabilities is particularly important to this matter, either if he is working in public or private compulsory education, or in adults education, or in private schools of informatics. That teacher is required to transmit to his pupils the necessary capabilities and knowledge, so that they can use correctly the new means and they are able to diagnose early and prevent the dangers that lurch in the internet and computers. [5]

A teaching program for the use of digital media therefore should balance between the two extremes: on one hand the pupils must become enthusiastic with digital tools and on the other hand they must be informed on the danger they should be protected against. Each skills module they are taught should include the potential risks and precautions to be taken. [6]

The pupils should know how to use correctly the digital media, as well as the consequences of frivolous and careless use. Furthermore the teacher has the opportunity to release himself from the curse of a single and limited curriculum, and to coordinate with the modern pedagogical concepts that want the pupils to be active in the teaching process, to interact and self-act, so that they build and strengthen knowledge and to construct their own cognitive schemes (constructivism) (Fragkou 2008).
Percentage of usage of Information and Communication Technologies (ICT) regarding to age and gender [7]

<table>
<thead>
<tr>
<th>Usage of ICT</th>
<th>Men</th>
<th>Women</th>
<th>&lt;39 years</th>
<th>40-49 years</th>
<th>&gt;50 years</th>
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<td>Usage of P/C for teaching preparation</td>
<td>66,1</td>
<td>66,2</td>
<td>74,5</td>
<td>66,7</td>
<td>42,1</td>
</tr>
<tr>
<td>Usage of ICT in the classroom</td>
<td>56,5</td>
<td>35</td>
<td>52,9</td>
<td>44</td>
<td>28,9</td>
</tr>
</tbody>
</table>

One of the reasons that the Greek teachers are relatively hesitant in the utilization of modern educational tools is the fact that only minimum of the supporting material is adapted to the Greek language and reality. For example, just the leading interactive whiteboards of the market are equipped with software in Greek, while the option of recognizing a Greek manuscript (handwriting on the whiteboard) is only recently developed.

**Educational methodology and software**

The modernization of education is materialized on the ground of utilization of new Informatics and Communication Technologies. One of the key questions in this effort regards the utilization of internet and other web services in educational procedure. Are there such educational methods that take essential advantage from the web services? There are such for sure. Among them, the idea of cooperative education is standing. As a term it may include the programs of cooperative learning (e.g. two or more schools participate jointly in a properly coordinated teaching program), of cooperation among teachers (e.g. collection of material from teachers communities) e.t.c. The pupils exchange information and ideas, they have access to various documents and files, information sources and they are able to solve problems working in groups [Raptis & Rapti, 1999]. The innovative characteristic of these services is the ability for communication. These are applications that may be centrally offered, e.g. from the education manager of a county, to a set of remote users, e.g. all the teachers or/and the pupils of the county.
Furthermore, these services allow the participants to contribute, to discuss, express their opinions and speculation and receive answers and assistance. More specifically, on the subject of Cooperative Learning, we would like to emphasize that eTwinning Programs presuppose exactly this way of cooperation, since they relate to groups of pupils and teachers on a specific issue and provide a wonderful opportunity for the materialization of pleasant and authentic cooperative learning in school reality, without many sources and media being required. The pupils learn to communicate with other European pupils, to make plans and choices, to make decisions together, to have arguments and to compromise. This way they move from the mechanical reproduction of knowledge to creative learning. eTwinning provides easy to use and communicative safe electronic tools for all the stages of a cooperation, promoting in the best way social networking in a safe environment.

In addition, the Cooperative Notebook exists. This application is a shared hypermedia database, designed to provide pupils with a support framework, when making a cooperative search for information [http://www.covis.nwu.edu/]. Cooperative search for information is considered desirable, since it represents the authentic usage of science from scientists. The main function of cooperative notebook is to permit the teacher to watch and guide the learning procedure.

Even the Web Educational Portal offers educational software from the plays Odyssey and Pleiades and the “comprehensive educational packages” with ready to use seminars for educational activities, as well as a large number of certified activities, scenarios and lesson plans, suggested sources in the internet, where every teacher is able to find anything helpful for the preparation and completion of his course. Furthermore, these technologies are already used successfully in the distance learning and self-education.

Distance learning, as a methodology and educational practice, began in the Universities of Australia and New Zealand in the 80s. The most recognized effort in Europe was the foundation of the “Open University” in England in 1971. Open Universities are founded all over the world and recently in Greece (law 2552/97: “Greek University and other Provisions”). [8]
Statistics for DL (distance learning):

Why students choose Distance Learning? [9]

<table>
<thead>
<tr>
<th>Reason to choose DL</th>
<th>PERCENTAGE</th>
</tr>
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<tbody>
<tr>
<td>Other commitments</td>
<td>88%</td>
</tr>
<tr>
<td>Choices for traditional classes were limited</td>
<td>20%</td>
</tr>
<tr>
<td>Thought that DL would be “easier”</td>
<td>6%</td>
</tr>
<tr>
<td>Other reasons</td>
<td>4%</td>
</tr>
</tbody>
</table>

Student reported educational outcomes [10]

<table>
<thead>
<tr>
<th>Educational outcome</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grades</td>
<td>Higher in DL – 59%</td>
</tr>
<tr>
<td></td>
<td>Higher in TL – 32%</td>
</tr>
<tr>
<td></td>
<td>About the same – 6%</td>
</tr>
<tr>
<td>Where did more learning occur?</td>
<td>DL – 57%</td>
</tr>
<tr>
<td></td>
<td>TL – 41%</td>
</tr>
<tr>
<td></td>
<td>About the same – 2%</td>
</tr>
<tr>
<td>Preference for DL vs. TL</td>
<td>DL – 69%</td>
</tr>
<tr>
<td></td>
<td>TL – 31%</td>
</tr>
<tr>
<td>Easier exams</td>
<td>DL 57%</td>
</tr>
<tr>
<td></td>
<td>TL- 42%</td>
</tr>
<tr>
<td></td>
<td>About the same – 1%</td>
</tr>
<tr>
<td>Text reading</td>
<td>DL – 92 %</td>
</tr>
<tr>
<td></td>
<td>TL – 57%</td>
</tr>
</tbody>
</table>

In the recent years school networking is particularly “fashionable”. The teachers, being sensitive in communication matters and in exchanging point of views, have been activated in this direction a long ago, creating initially simple online communities, through educational subjects’ Portals, where in forums they were able to discuss their reflections and exchange opinions, so that today we have achieved more formal structures e.g. the Hellenic Educational Online Community (HEOC) of the Hellenic School network, the specific forums of exams results centers for commenting on the themes of the University Entrance Exams, on-line communities for each specialty, on-line communities for specific actions – as the Environmental Education for each area or county - on-line communities for distance learning, students’ on-line communities, e.t.c. A search in the Internet will persuade anyone for the wide variety of these communities and will give anyone the opportunity to find what suits him, e.g. to find the answers to a problem, to participate in a learning community, to have access to educational material of his specialty e.t.c.

In general, on-line communities of teachers may give the opportunity to all the teachers, regardless of where they live, to communicate, exchange opinions, suggestions and thoughts on general issues of the Educational Community and on more specific issues as well, as on the content of the lessons for example.

The “e-yliko.gr” is the Formal Educational Portal of the Ministry of Education and is a place of meeting and mutual support of the educational community.

More specifically, in the unit Educational Material, the teacher may find Teaching Recommendations for every educational level and subjects with supportive material.
Furthermore, the usage of text editor is proved to be reinforcing, especially for children with reading difficulties. Briefly, the text editor is a complex cognitive tool that assists in the organization and revelation of thought. Therefore, new technology could be utilized from children with cognitive or physical weaknesses. This way an opportunity would be given for activity and spiritual creation. Of course this is not panacea for all the problems of children, it will contribute though to further mitigate them.

Another dimension of new technologies’ offer, perhaps the one with the greatest learning value, is the ability to communicate, cooperate and express oneself in the global village. This is achieved through teleconference or with the creation of web pages and educational portals. The advantages are obvious. The publication of pupils’ work in the school web pages is a powerful learning motivation. On the other hand, there is also the ability for teleconference, during which the pupils are able to communicate with other schools either in Cyprus or abroad for a bidirectional and tangible exchange of ideas and culture. In this way the pupils become “released”, even virtually, from the narrow space of their classroom, they express their ideas and they receive different aspects from other children, reinforcing ideas exchange. Communication with the “other” in culture has become now possible, the computer becoming a bridge of peace, understanding and democratic dialogue.

In addition, it is suggested that the teaching of lessons of school textbooks will be performed in the form of “electronic book”. In this form the simple images are replaced by many interactive applications, with ultimate aim the better understanding of the lesson.

A significant parameter of technology in education is the creation and utilization of educational software as a learning tool that advances metacognitive skills. Using selected software learning becomes more interesting and attractive, since image in combination with sound and movement are impressive for the pupils and arouse their interest for engagement (Tsakiri & Kapetanidou, 2007). This way, teaching the history of a certain period, together with information for the events and persons, one may present maps, marches, relationships, parallel events in the history of neighbor countries, or in cultural level, give at the same time information for literature, science, art, tradition, religion, language of the people, using images, sound and of course text. This kind of programs may be elaborated in cultural courses, aesthetic culture courses and knowledge courses. Many different techniques can also guarantee objective assessment of knowledge (self-assessment and hetero-assessment) that will facilitate Education. The most important though is that with this kind of programs School and generally Training and provided Education may acquire again the interest they need to get the affection and meaningful participation of pupils. [11]

In correlation with the degree of utilization of modern technologies in education in our country, we would say that especially the recent years we are on track. Both regarding the disposition of teachers to be informed on and to try on modern technologies in their classrooms and regarding the creation of infrastructures for the fast connection to Internet in all the school units. This means that the base to support and utilize modern technologies in education really exists. Yet, this is only the beginning. The effort for producing educational material should be reinforced, at the level of contractors and active teachers as well, who have a lot to offer due to their experience in the classroom; motivation, even financial for the teachers, should be provided. In addition, the training of teachers should be continuous and supported with flexible structures of Open and Distance Learning.
So far we have mentioned some of the positive aspects of new technologies. We should however point out also the problems, more or less important, that emerge. 

**Disadvantages of educational technologies**

The main disadvantage of web educational applications is their immaturity. Since the media is quite recent, regarding its usage in Greece, the available applications do not have a homogeneous structure, nor there any outstanding organization structure for information and services that outperforms the rest. Furthermore, low cost enables the creation of a large number of such applications, having as result the user to risk being lost in a sea of alternative options, the most of which are usually rough and poor in content.

**Conclusions**

It should be made clear that the computer should not become a device which will replace the teacher, but it will solely be a surveillant and communicative, modern tool that excites and mesmerizes pupils and will change its role in a qualitative way, from being a transmitter of knowledge to a coordinator, organizer and supporter of learning process.

Those dealing with the issue of utilizing new technologies in education are optimistic that we will see them soon play a key role in all the levels of Greek education. This way the classroom of the future will come to today and education will be technologically upgraded. We hope that technological upgrade will induce a wave of beneficial modernization in the base of Hellenic education.

As a conclusion we declare that Information and Communication Technologies in education provide the pupils of today and citizens of tomorrow with the indispensable assets that make them capable to adjust to the requirements of modern society, so that they avoid new inequalities and new forms of social exclusion [12]

In conclusion, the introduction and incorporation of informatics technology in education is a priority for any modern society and guarantees the citizens’ equal participation in the competitive Community of Information.

Therefore the reality is that without new technologies, without informatics and its many applications in the “community of information” that we live in, especially in the society of 21st century, no evolution of education can be perceived.
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A learner-centered school website focusing on teaching material:
The case study of 15th Junior High School of Peristeri

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Abstract
In this paper we present the basic principles and major keystones followed when developing the school website of the 15th Junior High School in Peristeri, Athens. Our priority was to find and utilize ready to use, but also to create as much digital multifarious educational material as possible for the educative support of our students, taking into account their learning potentials. Furthermore, we promoted group collaborative activities for our students through digital learning material, with the aim to learn through practice and participation.
Key words: learner-centered aims, learner profiles, school community, management model

Introduction
After using New Technologies in education for a few decades, our related research shows that trainees can learn better and teachers may be more effective [1]. School websites are within the framework of new tools available for us. The equipment of High Schools of the country, through the Greek School Network, with interface for the internet has affected many aspects of educational life, as for example electronic mail for administrative purposes and the usage of educational resources for teaching aims. The internet, as “a media for updating, viewing and publishing information”, has gradually led to the construction of school websites from teachers
and students [2]. The utilisation of websites in learning process improves communication among students and learning [3]. Through this activity multiple skills are cultivated at the members of school community that are involved, with the observation that in Greek reality there is no formal regulatory framework setting the specifications and evaluating the qualitative data for the function, structure and content of school websites [4]. For developing the school website of the 15th High School in Peristeri we took into consideration the above observations and relied on a development model based on one hand on the development model of Cascade and on the other hand we were mainly based in providing educational material. We attempted to provide as much variety in material as possible so that we could study its acceptance from students and evaluate its usage, beginning from the ones that initially were negatively disposed towards certain lessons and reaching to the ones with learning difficulties.

**Webpage development model**

The school webpage of the 15th High School in Peristeri was constructed using the Content Management System Joomla v.1.7.0 and installed in the servers of Greek School Network. The main dimensions of development and evaluation of a school webpage are in regard of these four areas [5]:

- **The basic descriptive information**
- **The pedagogical and educational considerations**
- **The offered knowledge attributes** και
- **The communication features**

In terms of design and structure, these parameters were entirely taken into consideration from the beginning, but we have given special attention to educational issues and the format of learning material hosted in the website.

The requirements for the design of screens and the usability were covered from the platform potentialities, with a few additional improving interventions and plugins, which are offered for free even in the used template.
The main menu of the webpage of 15\textsuperscript{th} High School in Peristeri initially contained 5 choices that reflected all the premature sections supported and was transformed so that to offer 12 choices.

Access to all the educational material is performed through a single link in the menu "students". There the class and the lesson of interest are selected, through carousel type rotating menus. Then, a section is selected from the list of available articles for the specific lesson.
Regarding implementation, the management and development of the webpage was based on a lighter edition of cascade or linear sequential model of development for digital educational software [6]. Whoever teacher of the school was willing to prepare an educational article for learning purposes had to cooperate with one of the two administrators in order to set the particular characteristics they wished and this way the material format was oriented. Then, the other administrator reviewed the material and finally the uploading was performed. The learning material was used for multiple purposes: it could be used during a session, or came as a result during the lesson elaboration and it was intended to be reused from the students whenever needed. The titles of articles with educational material were included in lists that were automatically updated immediately after their upload at the relative lesson.

Except from educational material, the webpage hosted also topics related to training material for colleagues, with the support from school administration, and promoted within-school activities and programs. During June 2012 the webpage hosted approximately 340 articles and showed a logarithmic growth curve.

### Educational material development

For the organization of learning material in the website the teachers in cooperation with administrators defined the categories of articles, so that they automatically appeared in the article list of each lesson. The team that started this work, which is the two administrators together with the headmaster, we hope to get as much response as possible from teachers. It is known that teachers do not easily accept innovative transformations in teaching, since they see incompatibility between traditional structure – that has relatively large inertia against alterations – and the adaptation to modern educational aims [7]. Finally 9 teachers participated, which is a 27% of the school teaching personnel, while a few more were interested but were unable to participate due to reasons such as a personal sense of knowledge inadequacy in order to support this effort, or were skeptical on the pedagogical use of internet and school webpage.

The utilisation of digital material in the existing variety and format gives the opportunity for pedagogical gratification of the most models of learning profiles that are suggested. Several studies are conducted in order to investigate the connection between lesson structure in the environment of eLearning and learning profiles of students. The structure of an eLesson affects students’ performance more or less and is associated with their learning profile, while the classical model of teaching seems not to be that much associated [8]. Graf and Kinshuk [9] have studied the behavior of students in online lessons and made a correlation with the learning profile model of Felder-Silverman. The study has shown that students, according to their profile,
followed different learning paths, they insisted on different learning objects and performed in a different way in assessment tests.

**Image 2: Articles categories and lessons with the number of educational articles**

In the present development phase of the webpage of the 15th High School, the educational material proposed to the students aimed to cover their potential preferences, without any prior test to define their learning profile. The teachers proposed simple Power Point presentations, texts in pdf format, videos and video-lessons, resources based on Adobe Flash, interactive interfaces of specific software (e.g. Geogebra) and digital comics. The base of the material proposed from teachers was a concept of the Learning Object, meaning the independent and autonomous unit
of educational material, which is designed to be reused in different educational frameworks [10]. It worth mentioning the particular interest of students for the educational comic created and uploaded in mathematics of the 1st class. The decision for creating and offering to students an educational comic came from relevant studies for its educational power [11]. Digital educational comics may produce remarkable learning result mainly due to reducing students’ negative predisposition and to providing better supervision in comparison with a conventional educational text. Students’ response to this specific comic was highly satisfactory, while they asked for more comics for other courses as well.

Another flow of material happened during learning process in the classroom with the utilization of Interactive Whiteboards (I.W.). Utilising the software capabilities of I.W. the teachers created videos, recording the activity on the blackboard (screen capture technique). These videos after being slightly processed by administrators were uploaded on the webpage. The videos provided students with material for repeating the class, which was useful during study for the next day class. Furthermore, this material assisted students to prepare for promotion exams, since it gave the opportunity to repeat the most significant parts of curriculum.

In addition to the above mentioned digital educational material, personal and group collaborative activities were organized from students themselves to create digital material. Organising students in groups serves modern educational objectives since it leads to the development of cognitive and social skills, such as communication, confidence, making joint decisions, crisis management, offering help to the group, understanding [12]. The students learn from each other with collaborative effort in an environment of interrelationship, since the success of team depends on personal contribution, something that reflects the complex structures of modern society [13]. For example, students of the 1st and the 2nd class of the High School, through group collaborative activity, created a dictionary of mathematical terminology for the cognitive subject of mathematics. For this purpose the students set themselves groups of 4 persons and cooperated for the presentation of mathematical terms of a specific chapter of the course. This activity involved a set of skills such as text composition using math symbols and images in digital format, with certain specifications, and the asynchronous communication between the members of the groups. In another occasion, for the English lesson of the 1st class, a student created an online vocabulary exercise utilizing the open software Tomboy & KWordQuiz. Even more, for the lesson of Music in the 3rd class, students created a video and selected the soundtrack they thought fit for their theme.

The evaluation of learning result of the educational material was mainly qualitative and was performed by asking questions to the students. The quantitative evaluation was performed using only the growth rate of visits and the final number of visits of the articles. The teachers that participated with educational material in the webpage and generally the whole team that was involved with the project were mainly interested on the response from students that were negatively predisposed for their lesson. Particular attention was paid to students with learning difficulties and their opinion for the help they got from the material was very important. As a rule, students with learning difficulties in the 1st class during the school year 2011-2012, who used the digital material, showed great satisfaction and declared that they were aided more from lessons with multimedia – in video or in a structure that incorporated animation, text and sound – as in example the lessons that were offered in the webpage www.skoool.gr. From the significant research study of Alty and Beacham [14], it is clarified that dyslexic students are clearly affected from the combination of
image, sound, charts and text that is included in a multimedia educational material. Among other findings stands also the fact that these students, although they process multimedia material containing combinations of sound, charts and text with more pleasure, they finally are more efficient when they study the plain text. In our case though, the conclusion is that dyslexic students did not prefer plain text in electronic format at all, so, by default, they got no assistance at all from this format.

Future Directions

The development of the webpage of the 15th High School in Peristeri during the school year 2011–12 was an achievement with multiple dimensions. It contained organization process, educational issues, cognitive objectives and research projects. The main objective was to provide assistance, at the learning tract, to the students of the school and secondary to provide informative and training material to colleague teachers, to further support the operation of the school and to promote within-school activities.

The offer to students of qualitative digital learning material is a heavy task, with huge demands in qualitative and quantitative levels as well.

The immediate goals of the team engaged with the support and update of the website of the 15th High School in Peristeri is the construction of eLessons for the greatest part of the taught lessons, of all the three classes, motivating teachers and students. In these lessons we aim to include as much range of multimedia teaching material as possible and self-evaluation activities as well.

At the same time we hope to continue, with better organization, the research work related to learning results of the material, concerning the material species offered, the children’s specific learning characteristics and the modern teaching approaches.

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