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Views of the Secondary Education Teachers on the Notion and Function of the Project Method

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Abstract: The present research aims to review the views of teachers on the notion and function of the project method. The research adopted the qualitative methodology approach. The analysis of the interviews given by teachers resulted in three general classes of personal positions and views relevant to "what the project method means for them": (a) the project method is conceived as a teaching and learning procedure, (b) it has specific structure and (c) its contribution in the development of the personality and skills of students is significant. The views of the teachers who participated in the research on the notion and function of the project method correspond to those expressed by the various representatives of the method, as these are stated in the literature. The project method is an innovative teaching method that can contribute in the redevelopment of the educational school operation and reverse a series of concepts that hogtie school life in a status of inaction, indifference and competitiveness.

Key words: teachers' views, project method, secondary education

1. Theoretical Basis of the Project Method

The scientific origin of the project method can be traced in the philosophical movement of the American pragmatism, which influenced the field of education and has been expressed by the movement of "progressive education" during most of the 20th century. John Dewey (1859-1952), one of the most important representatives of pragmatism, connects directly school and society and considers that the social life of students is the basis of their education and development as a whole. Knowledge, according to his views, must be reviewed in authentic frameworks that are in direct relation with the students' real life and routine. School ought to be based on the child's natural curiosity and learning must result from activities he/she is interested in. If the child's interest in the learning activities is taken into account, his/her active participation in the process of learning can be achieved. Dewey emphasizes the importance of the student's active participation in the learning process and praises the importance of the active approach to knowledge. He argues that the acquisition of knowledge by students must be the result of consideration and examination of their personal experiences, as all genuine forms of education is generated through experience. Learning by doing is the typical form of learning Dewey introduced, which then consisted the core of the project method that has been subsequently developed (Dewey, 1916).

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The idea of the method is an extension and application of his educational and philosophical views (Condliffe, 2017). Its instigator was Dewey's pupil and successor, W. H. Kilpatrick (1918), who, in his article "The Project Method: the use of the Purposeful Act in the Education Process" (1918), makes an attempt to clarify basic issues about the essence of the project method. It defines the project method "as the deliberate activity performed wholeheartedly within a social framework", emphasizing the presence of a clearly defined goal as basic element of the method. According to Kilpatrick (1918), four kinds of projects are indicating for teaching: (a) of structural type (e.g., the composition of a project), (b) pleasure (e.g., the experience of a piece of music), (c) problematic social issues (e.g., discussion about poverty) and (d) specific skills (e.g., learning how to swim).

The project method has been exceptionally accepted by the educational community. It has been deployed as an alternative teaching proposal instead of the dominating notion of traditional teaching, when students operate as "passive receptors" of the accumulated knowledge provided by the tutor, who plays the key part in the teaching process. The views of the theoretic supporters of constructivism have contributed in the broad acceptance of the method. Learning, according to constructivists, is an inner process attained through direct experience and the interaction with other people. The students do not build new knowledge by imitation or memorization, but through the analysis of their actions. They can reach deeper level of understanding of the material under study, when they are themselves actively involved in the teaching and learning procedure (Krajcik J., & Blumenfeld P., 2005). Furthermore, social constructivism, by emphasizing the social definition of knowledge, argues that the structuring of knowledge takes place in communicative and synergistic environments through dialogue and joint performance of activities (Kubiatko & Vakulova, 2011). The child is an active explorer in an environment characterized by continuous interaction with the others in his/her effort to acquire experiences and conceive the world around him/her (Vygotsky, 1978).

The project method, which in the last decades is internationally known as Project Based Learning, is an open process of learning without strict organization and structure and, therefore, one cannot find in literature just one definition that includes all its attributive elements (Bender, 2012). It is considered an especially demanding teaching method and its successful implementation depends on several factors, such as (Kokotsaki et al., 2016): (a) the adequate support of the students' work from the tutor's part, (b) the facilitation and the adequate support of the teacher's work from the part of the school administration, (c) the development of a synergy ambiance in the students groups, (d) the balance between the provision of instructions and information from the part of the tutor and the students' autonomy during their activities, (e) the provision of feedback to students from the part of the teacher, as well as the evaluation of the students' work from themselves, (f) the possibility of choice, assumption of initiatives and decision making from the part of the students themselves.

2. Review of Research on the Project Method

The project method has been extensively studied internationally. The research conducted reveal its positive results in (a) the acquisition of knowledge by students and the improvement of their academic performance (Al-Balushi & Al-Aamri, 2014; Baş, 2011; Boaler, 1998; Doppelt, 2003; Geier et al., 2008; Halvorsen et al., 2012; Hernández-Ramos & De La Paz, 2009; Hsu et al., 2015; Kaldi et al., 2011; Karakali & Korur, 2014; Summers & Dickinson, 2012), (b) the deep understanding of the subject they study (Boaler, 1998; Geier et al., 2008), (c) the development of skills, such as communication skills (Hsu et al., 2015), procedural skills (Geier et al., 2008), (d) the presence of high initiatives relevant to the teaching and learning procedure (Al-Balushi & Al-Amri, 2014 ;

Barak & Asad, 2012; Baş, 2012; Doppelt, 2003; Hernández-Ramos & De La Paz, 2009; Kaldi et al., 2011; Koutrouba & Karageorgou, 2013; Lou et al., 2011; Mioduser & Beser, 2007), (e) the development of self-esteem (Boubouka & Papanikolaou, 2013; Koutrouba & Karageorgou, 2013), (f) the positive effect on students with low academic performance (Doppelt, 2003; Halvorsen et al., 2012) and (g) the development of the higher functions of the students' mind, as, for example, creative thinking (Akinoglou, 2008; Boaler, 1998; Daskolia, Dimos & Kampylis, 2012).

Worldwide research has shown the need for specialized further training of the teachers in the implementation of the project method (Capraro et al., 2016; Cook & Weaver, 2015; Tamim & Grant, 2011). As this is an especially demanding and complicated teaching method, teachers face at times difficulties in its implementation. Their good intentions for the implementation of the method in the classroom can be undermined by the lack of knowledge on the planning and realization of a project, the lack of material for the conduct of the activities and the inadequate support of the teachers' work from the part of the school administration due to conflict of interests among the people involved and the excessive work load put on students and, finally, the deficient teaching skills of the teachers themselves (Kokotsaki et al., 2016).

Few research (Dogan et al., 2013; Habók & Nagy, 2016; Han et al., 2015; Hertzok, 2007; Marshal et al., 2010; Novák, 2017; Ozel, 2013; Petersen, 2016; Tamin & Grant, 2013; Turgut, 2008) has been conducted concerning the views of teachers about the project method. This is a major gap, as the role of the teachers is especially important for, they are the people most directly related to the act of teaching and play active role in the drawing and promotion of the educational goals and school practices. Their ideas and views on teaching and learning define their behavior in class, as well as their teaching practices (Daskolia, Dimos & Kampylis, 2012). Therefore, the correct implementation of the project method, depends on how they see this method and, thus, approach the teaching reality

3. The Implementation of the Project Method in Greece

In Greece, the establishment of the Interdisciplinary Common Curriculum Framework in 2003, consists an attempt for broader utilization of the project method in the Greek school system. The Curriculum[1] stipulates the drawing of cross-thematic projects in all subjects taught, in about 10% of the total teaching time for each thematic unit (Greek Pedagogical Institute, 2003).

The method has been especially boosted in the recent years by the optional programs of Environmental Education, Health Education and Cultural Subjects, which use the project method in the methodology of their development. The Curriculum for the Secondary Education assigns to a teacher (or a team of teachers), regardless of their specialty), the voluntary conduct the Program two hours weekly with a group of students who have freely chosen to participate in the Program. The subjects are selected by the students with the assistance of the teachers (Greek Ministry of Education and Religious Affairs, 2019).

The Programs of Environmental Education, Health Education and Cultural Subjects, that take place in the Secondary Education last four (4) to five (5) months, beyond the hours of the timetable, two hours weekly, with the exception of students of the 1st class of the Vocational Senior High Schools who participate in school activities in the framework of the "Creative Activities Section" (Greek Ministry of Education and Religious Affairs, 2019).

Since 2011, the Inquiry Learning Projects have been established in High School as part of the compulsory

[1] http://www.pi-schools.gr/programs/depps/.

curriculum under the term "Research Work". The "Research Works" are conducted within the Timetable, two hours weekly in the 1st and 2nd class of High School, on subjects selected by the students. The duration of each research work is four months and the students must mandatorily assume two during the school year (Greek Ministry of Education, Research and Religious Affairs, 2018).

In order to facilitate teachers' work, the books published by the Ministry of Education[2] for them include guidelines on the drawing of projects. At the same time, at various periods of time, several bodies of the Ministry perform seminars for the training of teachers.

4. The Present Research

The few research works that have been conducted internationally and concern the views of teachers about the project method was the incentive that made us perform the present research. In the present paper, we discussed just a part of our research, which concerned the investigation of the views of Secondary Education teachers on the notion and function of the project method.

5. Methodology

The research has been based on the principle, the criteria and the procedures of a qualitative methodology design. Its goal was the investigation of the views of teachers on the notion and function of the project method. Thirty-seven (37) Secondary Education Teachers from the District of Attiki, who had been using the project method in the optional programs of Environmental Education, Health Education and Cultural Subjects, participated in the research. The selection of the sample has been made by the method of maximum differentiation and used as criteria the gender, the scientific specialization, the age and the degree of their involvement in the project method. The semi-structured interview has been used for the collection of data. The teachers have been asked, after they defined the project method, to report what the method offered to students and the Greek school. They have been asked questions about the appropriate for the said method teacher's role, their incentives to get involved in the project method, as well as questions resulting each time from the dialogue between the researcher and the teacher, for the best possible approach to the issues of the research. The teachers have been also asked to provide a thorough report of the way they design and realize a project. The interviews have been performed in school years 2012-2015. Each interview lasted 60 to 90 minutes.

The interviews have been transcribed and formed a written text. Then, two separate analysts, using thematic analysis (Braun & Clarke, 2006), processed the interviews transcripts.

The classification of the teachers' views on the "notion and function of the project method" has been performed according to the attributive elements of the method as found in the literature (Habók & Nagy, 2016). These are: (a) The close connection between learning and life and action, (b) The organization and planningn of activities, (c) The cooperation between the participants, (d) The research procedures, (e) The activation of students' interest, (f) The study of real situations in a holistic way, (g) The active approach of knowledge, (h) The freedom of choice and decision making provided to students and (i) The advisory role of the tutor.

The results of the process of the interviews by each analyst have been discussed and compared and thus the inter-rater reliability has also been achieved (Cantrell, 1993). Indicative extracts from the teachers' interviews are

[2] http://digitalschool.minedu.gov.gr.

cited in our paper aiming to the more complete presentation of their views.

The Table shows the characteristics of the research sample in detail. In order to ensure the anonymity of the teachers who participated in the research, we do not state their names neither do we provide further details on the school they worked with at the particular time of the interview. The presentation and further reference to each of the participants in the research is made by a code informing about the gender, the age and the scientific specialty of the teacher.

Table 1 Participants' Demographics

Gender	Female	20
	Male	17
Age	30-40	4
	41-50	22
	51-60	11
Total of projects	1-5	11
	6-10	9
	11-15	17
Subject expertise	Greek Language	7
	Foreign Language	3
	Arts Education	3
	Physics	8
	Biology	3
	Music Education	1
	Technology	4
	Math	3
	Computer science	2
	Gym	2
	Sociology	1

6. Presentation and Discussion of the Results

Before the presentation of the results we would like to emphasize that the nature of the research itself (qualitative-investigatory) is not suitable for the drawing of conclusions that could be generalized as a whole. The analysis of the research data allows the formulation of several general remarks relevant to the emergent trends, which, however, necessitate further investigation and confirmation in the future.

The collection of the interviews, their transcription and their analysis has been performed in the Greek language, but both the results and the indicative extracts of the teachers' interviews are presented in the present paper in the English language. Therefore, a misinterpretation of the data collected may have resulted despite our efforts to provide the most exact possibly translation of the teachers' answers into the English language.

7. Investigation Question: "What does the Project Method Mean to You?"

The transcripts of the interviews, both in the teachers' answers to the relevant question asked ("What does the

project method mean to you?") and in other parts of their speech, identified their views on the notion of the project method and its function in education.

The analysis of the teachers' interviews resulted in three general classes of personal positions and views regarding "what the project method means to them".

(a) The project method is seen as a teaching and learning procedure, (b) Has specific structure, (c) Is considered that it contributes in the development of the personality and skills of the students in a positive way.

7.1 Teaching and Learning Procedure

The majority (35/37) of the participants in the teachers' research sees the project method as a teaching and learning procedures.

The principles and the characteristics of this procedure, according to teachers are (Habók & Nagy, 2016):

(a) its differentiation from the traditional teaching and learning procedure, (b) learning through experience, (c) the "opening of the school" to the society, (d) the search and research, (e) the interdisciplinarity/inter-scientificity, (f) the active way in which knowledge is approached, (g) the positive results in the cognitive field, (h) the ambiance of free expression and action, (i) the different role of the teacher in relation to the traditional classroom, (ia) the activation of the students' interest.

Some teachers mention characteristically:

"We can say that this is an innovative teaching process" (M17-40, Greek Language).

"... (with the project method) we pass from the teacher-centered to student-centered teaching…" (F6-43, Technology)

"It is a way of different teaching approach, when children are given the chance to learn and express views and feelings as well in a different way…" (F3-50, Physics)

"...children find the possibility to enter in this process called experience learning, i.e., I learn by experiencing something…" (M1-45, Math)

"⋯it is not mere desiccated knowledge children have to listen to and then say again, it is participative knowledge, social knowledge…" (M9-56, Physics)

"...it gives (me) the chance to discuss with the children some things about their everyday life and so that will together find solutions to the problems of their routine..." (F6-43, Technology)

"Then, another possibility for them is to proceed to the procedure of research..." (M1-45, Math)

"...interdisciplinarity, for instance, can be realized in one project..." (A10-48, Technol.)

"⋯(the project method) can also be used both in Art and Math..." (F5-39, English Language).

"...first of all, it gives them a chance to work on issues their curriculum does not include and approach them in a way that will render their participation necessary and their sensibilization sure…" (M2-42, Technology)

"⋯it offers the pleasure of creation, as it is something they — at first — chose themselves and process it according to their interests" (F3-50, Physics)

"The (teachers's) role must be advisory" (F18-52, Greek Language).

"... (with the project method) we can ask them about the problems that concern them and discuss with them issues that are of interest for them" (M17-40, Greek Language).

7.2 Structure of the Project Method

A large number of teachers (31/37), in their effort to define the method, shows up the importance of its structure.

The teachers refer to the processes conducted in consecutive and predetermined stages during the development of a work plan. This method is realized through a series of basic stages and systematic actions leading to a certain result. The planned actions, according to teachers, consists the starting point of learning in the drawing of a project. The purpose and the goals of the project are clearly determined and the time and actions for their achievement are planned (Stix & Hrbek, 2006).

Some teachers state:

"⋯.(the project method is) the process that, through various stages, leads to an end goal." (M8-56, Greek Language)

"...certainly, the most basic feature is that its structure is such that it can start from a certain point and end to a result…" (M2-42, Technology)

"⋯..the process based on which one can achieve a result…" (M15-49, Greek Language).

"It is a method that includes several stages in order for one to realize various goals defined in the beginning…" (F17-50, Physics).

During the realization of a project, in case the initial planning does not function properly, it is redefined (Bender, 2012).

Some teachers state:

"...this means that starting from an idea, this idea is molded and changes according to the projects and the work performed by the children and the discussion one has within and the possibilities each child possesses…" (F13-42, Arts Education)

"⋯(during a project) I redetermine several things." (M5-54, Physics)

The teachers consider the team, which is responsible for the design of the activities and the fulfilment of the purpose of the work plan, a deciding factor of the project method. One of the fundamental elements of the method is the collaboration of all people involved and the coordination of the activities of the members of the groups (Milentijevic et al., 2008).

Some teachers state:

"(I consider the project method) a method of collaboration…" (F13-42, Arts Education)

"The students do not act at the personal level anymore and have to operate at a collaborative level..." (F18-52, Greek Language).

During the development of a work plan, other methodological approaches and teaching practices can be also applied, as, for example, work in the field or theatrical play (Markham, 2011).

Some teachers state:

"...and gives them the chance to combine other methods too through this one…" (M2-42, Technology).

"⋯and the field study performed…" (F10-43, Gym)

"...can include some kind of play, include theatrical play, include arguments..." (F13-42, Arts Education)

7.3 Development of the Personality and Skills of Students

Fewer teachers (26/37), compared to the previous two general thematic classes, try to define the project method emphasizing the development of the personality and skills of the students, which they have not the chance to cultivate in the classroom. The particular method intends to render the learning conditions in school more substantial and provides the students the possibility to develop significant sides of their personality, which are neither promoted nor supported by traditional forms of education (Boaler, 1998; Halvorsen et al., 2012; Hsu et al.,

2015). By their participation in a project:

(a) students develop communication and collaboration skills, (b) learn to investigate and resolve problems, (c) cultivate their critical and creative thinking, (d) "learn how to learn", (e) acquire awareness on various important subjects and issues and, finally, (f) the capabilities of each and every student are highlighted and expressed.

Some teachers state:

"...(they) learn to argue, collaborate…" (F5-39, English Language).

"...what I intend to do is the socialization of students..." (M9-56, Physics).

"(the student) learns how to learn…" (M15-49, Greek Language).

"...(the project method) cultivates the student's critical thinking... helps him/her change his/her attitude in life…» (F16-42, Sociology.).

"...it can develop their teamwork, creativity, imagination and activate them to resolve various problems" (F1-52, Biology)

"...it cultivates the student's critical thinking and his/her self-motivation, the development of his/her skills, it helps him/her change his/her attitude in life..." (F16-42, Sociology.).

"...students are given various stimuli that help them realize some specific problems and find their solutions" (M4-48, Physics).

"⋯(the project method) proves exactly how important this is for children who get bored with the typical curriculum or who for various reasons cannot respond and gives them the chance to show particular aptitudes, particular interests, other inner incentives" (M2-42, Technology).

8. Findings of the Research

The review of the views of teachers is an important field of research, as it is proven that their ideas affect and direct their teaching practices. Their established knowledge and their experiences from the implementation of the project method in the classroom can offer useful information and angles of view to research scientists, to the people drawing the educational policy and the Curriculums, as well as to the people responsible for the drawing of further training programs for teachers.

The present research is one of a few chances given to teachers to express their views on the project method and its implementation in the modern educational reality. Our purpose was to examine how teachers see the project method. Their views in the notion and the function of the project method correspond to those of the various representatives of the method, which are stated in the literature.

We consider that this finding underlines the need for further investigation of the teachers views on the project method, which will be focused on different educational environments and will use a combination of different methodological tools.

In the teachers views, the notion and function of the project method is illustrated (a) as a teaching and learning procedure, (b) as a method with specific structure and (c) as a factor for the development of the students' skills and capabilities.

The majority of teachers, who see the project method as a "teaching and learning procedure", are focused on the principles and characteristics of the method, which differentiate it from the established teaching and learning procedures, that take place in the traditional classroom. The students are in the center of this process, as they play the leading role in the course of the development of the project and the activities conducted. A free ambiance for

expression and action is created, where the students themselves make the decisions about the learning actions that will take place and will lead them to the autonomous acquisition of knowledge and skills. The teachers note that the learning process is adapted to the students' needs and interests and the knowledge is directly connected to practice in conditions that ensure the generation of knowledge. Particular emphasis is given to the active participation of students and their personal contribution in the teaching events. The students have the chance to discover knowledge by themselves through procedures of research, ingenuity, examination and problems solving. The project method is a mostly student-centered teaching and learning method that inevitably changes also the role of teachers. The project method demands that the teacher will not be the central person in the teaching process. The personal way in which teachers see the method represents also the concept connecting directly the holistic view of knowledge and the possibility for inter-scientific and interdisciplinary approach of the various issues.

Several research works support the necessity for active participation from the part of the students in the procedure of learning and direct connection of knowledge with action in environments related to real life (Schunk, 2012). In addition, according to scientists, it is considered necessary that teaching should take into account the inner incentives of students for knowledge and creation (Bransford et al., 2000) and that knowledge should be examined in a holistic way through procedures of research and the finding of solutions for original problems (Daskolia, Dimos & Kampylis, 2012).

The emphasis on the importance of the structure of the project method consists the second in line approach in the way teachers see the project method. The project method is a complicated form of teaching and learning that consists of a combination of separate elements. As teachers note, a project is developed in time at a specific direction and with specific processes and systematic actions performed in consecutive and predetermined stages. However, several teachers state that the stages of the progress of a project, its pace, the ways of movement and the procedures are not mandatory data. The project method is developed according to the creative and free intervention of the interested parties. In any case, the adaption of the method to the conditions of the environment, time and interests of the people directly involved in its implementation is one of its basic features. The planning of actions and the drawing of purposes and goals is of great importance too for the progress of a project. Without a plan of actions that will lead to a direction and a framework binding the participants in a uniform way of action in a specific manner and in a defined period of time, luck starts to have great contribution and, therefore, there is a risk of degeneration of the project in actions without goals or purposes. Certainly, as teachers state, the realization of the project is performed in interaction with its planning, meaning that although it is based on it, it can result in a redefinition of the separate goals, the time schedules and the predefined actions. The collegiality and collaboration of the participants is also emphasized by teachers as a fundamental element of the project method. The participants in a project form groups of active people, which lean through the work and the activity of the whole. Its end yield, if there is, of course, is a result of joint actions, processed and transferable to all members of the group. During the development of a project, students have the possibility to apply other methodological approaches and teaching techniques as well for the achievement of their purpose and goals.

The project method is an open learning process that can include other teaching methods as well. Helle et al. (2006) consider the project method as a team-synergistic form of learning, as all participants plan and coordinate the activities in order to achieve a common goal. The Planning, according to Kilpatrick (1918) is of great importance for the realization of a project, as it binds the people involved to uniform activity in a specific way and in a specific period of time. Activity without plan and schedule includes actions depending on the circumstances

and allows serious contribution of accidental factors. Therefore, a plan of activities is necessary, providing a direction, a framework binding the people involved and guiding them to the realization of their common goal.

The development of the students' personality and skills is the third general class depicting teachers' views on the notion and function of the project method. The project method emphasizes the development of the students' personality as a whole by cultivating capabilities and skills not supported by the traditional school that "stubbornly" insists in the cognition-based model of learning and education. The pedagogists of the project method, as teachers emphasize, forms a framework for communication and collaboration between students and students and adults. Students learn to argue, express their views in a persuasive manner and collaborate in order to achieve common goals. Thus, a basic function of pedagogy is achieved; that of the strengthening of the social aspect of the personality of students. During the realization of a project, the conditions contribute in the release of education from the dominancy of knowledge and lead to the development of the capabilities of students' thinking, as, for example, critical and creative thinking. Students acquire skills of research and problems solving, as they use research approaches in the management and solving of problematic situations they face during the drawing of a work plan. The balanced development of the personality of students is also achieved through the cultivation of their emotional world and the acquisition of social awareness. As teachers state, students, who in a traditional classroom remain in "obscurity", in the framework of the conditions created during the drawing of a project can highlight and express their capabilities and skills and even find themselves at the first rank. Finally, teachers also state explicitly the learning of the way knowledge is acquired during the drawing of a project, i.e., the development of the student's capability to "learn how to learn".

The project method, according to several views (Thomas, 2000), provides the possibility of response to the different learning profiles and the multiple I.Q.s of students (Gardner, 1993, 1999) in a larger scale than teaching in a traditional classroom. Research on learning profiles have shown that people present differences in the way in which they conceive and process information (Kolb, 1985). In addition, Gardner (1993, 1999) believes that people possess eight forms of intelligence expressed in different skills and capabilities. A student can possess capabilities in a certain field but this feature may not be accompanied by the equivalent conclusions on his/her capability in other fields. Students must be given the possibility to cultivate different types of intelligence and teaching must respond to the different learning profiles.

References

Akinoglou O. (2008). "Assessment of the inquiry-based project application in science education upon Turkish science teachers' perspectives", Education, Vol. 129, No. 2, pp. 202–215.

Al-Balushi S. M. and Al-Aamri S. S. (2014). "The effect of environmental science projects on students' environmental knowledge and science attitudes", *International Research in Geographical & Environmental Education*, Vol. 23, No. 3, pp. 213–227.

Barak M. and Asad K. (2012). "Teaching image-processing concepts in junior high schools: boys' and girls' achievement and attitudes towards technology", *Research in Science & Technological Education*, Vol. 30, No. 1, pp. 81–105.

Baş G. (2011). "Investigating the effects of PBL on students' academic achievement and attitudes towards english lesson", *The Online Journal of New Horizons in Education*, Vol. 1, No. 4, available online at: http://www.tojned.net/pdf/tojnedv01i04-01.pdf.

Bender W. N. (2012). *Project-Based Learning: Differentiated Instruction for the 21st Century*, Thousand Oaks, CA: Corwin.

Boaler J. (1998). "Open and closed mathematics: Student experiences and understandings", *Journal for Research in Mathematics Education*, Vol. 29, No. 1, pp. 41–62.

Boubouka M. and Papanikolaou K. A. (2013). "Alternative assessment methods in technology enhanced project-based learning", *International Journal of Learning Technology*, Vol. 8, No. 3, pp. 263–296.

Bransford J. D., Brown A. L. and Cocking R. R. (Eds.) (2000). *How People Learn: Brain, Mind, Experience and School*, Washington, DC: National Academy Press.

Braun V. and Clarke V. (2006). "Using thematic analysis in psychology", *Qualitative Research in Psychology*, Vol. 3, No. 2, pp. 77–101.

Cantrell D. C. (1993). "Alternative paradigms in environmental education research: The interpretive perspective", in: R. Mrazek (Ed.), *Alternative Paradigms in Environmental Education Research, Monographs in Environmental Education and Environmental Studies*, Vol. VIII, Troy, OH: NAAEE, pp. 81–105.

Condliffe,B., Quint J., Visher, M. G., Bangser, M. R., Drohojowska S., Saco L. , Nelson E. (2017). Project-Based Learning A Literature Review. MDRC.

Daskolia M., Dimos A. and Kampylis P. (2012). "Secondary teachers' conceptions of creative thinking within the context of environmental education", *International Journal of Environmental & Science Education*, Vol. 7, No. 2, pp. 269–290.

Dewey J. (1916). *Democracy and Education*, New York: The Free Press.

Dogan Y., Batdi V. and Yildirim B. (2013). "Teachers' views on the practice of project-based learning approach in primary school science education", *International Online Journal of Education Sciences*, Vol. 13, pp. 1–9.

Doppelt Y. (2003). "Implementation and assessment of project-based learning in a flexible environment", *International Journal of Technology and Design Education*, Vol. 13, No. 3, pp. 255–272.

Gardner H. (1993). *Multiple Intelligences: The Theory in Practice* (New ed.), New York: Basic Books.

Gardner H. (1999). *Intelligence Reframed: Multiple Intelligences for the 21st Century*, New York: Basic Books.

Geier R., Blumenfeld P. C., Marx R. W., Krajcik J. S., Fishman B., Soloway E. and Clay-Chambers J. (2008). "Standardized test outcomes for students engaged in inquiry-based science curricula in the context of urban reform", *Journal of Research in Science Teaching*, Vol. 45, No. 8, pp. 922-939.

Greek Ministry of Education, Research and Religious Affairs (2018). "Odhgies gia th didaskalia toy mathmatos Ereynhtikes Dhmiourgikes Drasthriothtes stis A kai B taxeis Hmerhsiou Genjkou Lykeiou gia to scholiko etos 2018-2019", accessed on March 29, 2020, available online at: https://www.minedu.gov.gr/.

Greek Ministry of Education and Religious Affairs (2019). "Schediasmos kai ylopoihsh programmaton scholikon drasthriothton (Perivallontikhs Ekpaideyshs, Agoghs Ygeias, Politistikon Thematon) gia to scholiko etos 2019-2020", accessed on March 29, 2020, available online at: https://www.minedu.gov.gr/news.

Greek Pedagogical Institute (2003). "A cross thematic curriculum framework for secondary education", accessed on March 29, 2020, available online at: http://www.pi-schools.gr/programs/depps/.

Habók A. and Nagy N. (2016). "In service teachers' perceptions of project based learning", *Habók and Nagy Springer Plus*, Vol. 5, No. 83, pp. 2-14, doi: 10.1186/s40064-016-1725-4.

Halvorsen A. L., Duke N. K., Brugar K., Berka M. and Brown J. (2012). "Narrowing the achievement gap in second-grade social studies and content area literacy: The promise of a project-based approach", Working paper 26, The Education Policy Center: Michigan State University.

Helle L., Tynjälä P. and Olkinuora E. (2006). "Project-based learning in post-secondary education-theory, practice and rubber sling shots", *Higher Education*, Vol. 51, pp. 287–314.

Helm J. and Katz L. (2011). *Young Investigators: The Project Approach in the Early Years*, New York, NY: Teachers College Press.

Hertzog N. B. (2007). "Transporting pedagogy: Implementing the project approach in two first-grade classrooms", *Journal of Advanced Academics*, Vol. 18, No. 4, pp. 530–564.

Hernández-Ramos P. and De La Paz S. (2009). "Learning history in middle school by designing multimedia in a project-based learning experience", *Journal of Research on Technology in Education*, Vol. 42, No. 2, pp. 151–173.

Hsu P. S., Van Dyke M., Chen Y. and Smith T. J. (2015). "The effect of a graph-oriented computer-assisted project-based learning environment on argumentation skills", *Journal of Computer Assisted Learning*, Vol. 31, No. 1, pp. 32–58.

Kaldi S., Filippatou D. and Govaris C. (2011). "Project-based learning in primary schools: Effects on pupils' learning and attitudes", *Education*, Vol. 39, No. 1, pp. 35–47.

Karaçalli S. and Korur F. (2014). "The effects of project-based learning on students' academic achievement, attitude, and retention of knowledge: The subject of 'electricity in our lives'", *School Science and Mathematics*, Vol. 114, No. 5, pp. 224–235.

Kilpatrick T. (1918). "The project method", *Teachers College Record*, Vol. 19, pp. 319–335.

Kokotsaki D., Menzies V. and Wiggins A. (2016). "Project-based learning: A review of the literature", *Improving Schools*, Vol. 19, No. 3, pp. 267–277.

Kolb D. (1985). *Learning Style Inventory*, Boston: McBer & Co.

Koutrouba K. and Karageorgou E. (2013). "Cognitive and socio-affective outcomes of projectbased learning: Perceptions of Greek second chance school students", *Improving Schools*, Vol. 16, No. 3, pp. 244–260.

Krajcik J. and Blumenfeld P. (2005). "Project-based learning", in: R. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences*, Cambridge: Cambridge University Press, pp. 317–334, doi: 10.1017/CBO9780511816833.020.

Kubiatko M. and Vaculova I. (2011). "Project-based learning: Characteristic and the experiences with application in science subjects", *Energy Education Science and Technology Part B: Social and Educational Studies*, Vol. 3, No. 1, pp. 65–74.

Lou S. J., Liu Y. H., Shih R. C. and Tseng K. H. (2011). "Effectiveness of on-line STEM project-based learning for female senior high school students", *International Journal of Engineering Education*, Vol. 27, pp. 399–410.

MacMath S., Sivia A. and Britton V. (2017). "Teacher perceptions of project based learning in the secondary classroom", *Alberta Journal of Educational Research*, Vol. 63, No. 2, pp. 175–192.

Markham T. (2011). "Project based learning", *Teacher Librarian*, Vol. 39, No. 2, pp. 38–42.

Marshall J. A., Petrosino A. J. and Martin T. (2010). "Preservice teachers' conceptions and enactments of project-based instruction", *Journal of Science Education and Technology*, Vol. 19, pp. 370–386.

Milentijevic I., Ciric V. and Vojiovic O. (2008). "Version control in project-based learning", *Computers & Education*, Vol. 50, pp. 1331–1338.

Mioduser D. and Betzer N. (2008). "The contribution of project-based-learning to high achievers' acquisition of technological knowledge and skills", *International Journal of Technology and Design Education*, Vol. 18, No. 1, pp. 59–77.

Ozel S. (2013). "Who, when, and where", in: R. M. Capraro, M. M. Capraro and J. Morgan (Eds.), *STEM Project-based learning: An Integrated Science Technology Engineering and Mathematics (STEM) Approach*, Rotterdam, Netherlands: Sense, pp. 41–46.

Petersen C. (2016). "Project-based learning through the eyes of teachers and students in adult ESL classrooms", *Canadian Modern Language Review*, Vol. 72, No. 1, pp. 13–39.

Schunk D. H. (2012). *Learning Theories: An Educational Perspective*, Boston MA: Allyn & Bacon.

Stix A. and Hrbek A. (2006). *Teachers as Classroom Coaches: How to Motivate Students Across the Content Areas*, USA: Association for Supervision & Curriculum Development.

Summers E. G. and Dickinson G. (2012). "A longitudinal investigation of project-based instruction and student achievement in high school social studies", *Interdisciplinary Journal of Problem-Based Learning*, Vol. 6, No. 1, pp. 82–103.

Tamim S. R. and Grant M. M. (2013). "Definitions and uses: Case study of teachers implementing project-based learning", *Interdisciplinary Journal of Problem-Based Learning*, Vol. 7, No. 2, pp. 72–101, doi: https://doi.org/10.7771/1541-5015.1323.

Thomas J. W. (2000). "A review of research on project-based learning executive summary", San Rafael, CA: The Autodesk Foundation, available online at: http://www.k12reform.org/foundation/pbl/research.

Turgut H. (2008). "Prospective science teachers' conceptualizations about project based learning", *International Journal of Instruction*, Vol. 1, No. 1, pp. 61–79.

Vygotsky L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*, Cambridge, MA, London: Harvard University Press.