Critical Thinking and Interaction in online education as a factor of raising awareness, changing attitudes and transforming citizens' inaccurate assumptions about the environment

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Abstract: In the present study the bibliographicestablished presumption that in an adult learning environment the interaction between participants, with activities that promote reflection and critical thinking, contributes decisively to the change of established perceptions and dysfunctional assumptions.On the basis of this vision, data from the planning, implementation and evaluation of an online learning environment are presented, in terms of its contribution to changing teachers' attitudes towards environmental issues. The data were processed by qualitative analysis of the messages developed in the course modules, by analyzing the interactions developed through the theory of graphs, as well as quantitative data derived from the answers of the participants in special questionnaires. Research evidence suggests that fostering interaction between participants in an online learning environment through reflective and critical thinking contributes positively to meeting the goals set. At the same time, it can lead to questioning the validity of established perceptions and mistaken assumptions about the environment, on which we often understand and interpret reality.

Keywords:reflection, critical reflection, interaction, environment, attitudes, assumptions, e-learning

Introduction

As energy and environmental issues are globally recognized and pose a threat to both the quality of life and the sustainability of the planet, it is more than ever clear that the basis of ecological reflection and the search for effective energy solutions, is more related to changing human behavior and changing attitudes, perceptions and environmental mistakes of a large proportion of population. In this context, modern developments in the field of digital technology combined with the development of the Internet, telecommunications and technology systems offer the opportunity to support learning at the place and at the time the

trainee wishes and provide significant and alternative opportunities in the field of communication, information, awareness raising and training of citizens (Kioulanis, Tsatiris, Galatsidas, Kitikidou, 2014).

A key component in adult education is the use of learner experience. Empirical training is the training that exposes trainees to an experience and then encourages reflection on it to develop new skills, new attitudes or new ways of thinking (Karatza,Koulaoudidis,Spanaka, 2012).

Kolb (1984) pointed out that trainees' occupation with abstract ideas and concepts does not lead to effective learning because it is a process cut off from reality and asymmetrical with the conditions they face. On the other hand, when learning focuses on problems arising from participants' experiences it becomes more effective.

Under the influence of these visions and during the 2015-2016school year, we planned and implemented the online project "Building the School of the Future" on the asynchronous e - learning platform of Secondary Education Directorate in Drama. Theoretically, the project was designed based on the stochastic model of Boud, Keogh, Walker (1985, 2002), dominated by the return to experience, the sentiment approach, and the re-evaluation of the experience. The work in groups as well as the interaction developed were based on the reflective interaction model called Reflective Interaction through Virtual Participants (Kioulanis, 2013). The parallel activities during the training were designed based on cooperative and creative learning activities.

The process was attended by 457 teachers who worked together in the perspective of the school of the future on the basis of axes on didactic methodology, educational management, human relations, environmental awareness and sensitization.

In this study we focus on the axes of environmental awareness and sensitization of citizens’, in relation to the impact their participation in an online learning environment focused on the principles of stochastic learning can have on them.

1. Reflection and critical reflection

Jarvis (1987, 1992) argued that the learning process starts from the moment a person comes into contact with a social experience that offers learning. He argues, in fact, that our whole life can be considered as a continuous learning phenomenon, which is developed in a complex and diverse social-cultural environment. In fact, on the basis of these views, he divided learning into reflective and non - reflective, meanwhile introducing the concept of non - learning in which the experiences experienced by an adult do not lead to learning for reasons such as fear of change, arrogance, or simply rejecting the learning dimension of experience.

For John Dewey, another thinker of experiential learning, reflection refers to evaluating the justification of an individual's belief, that is, the process of logically examining the conclusions with which his beliefs are justified.

Reflection can be an integral part of the decision one gets about how effectively he should act, or it can also include a post reassessment of the data. The post reassessment reflection re-examines prior learning and focuses on assumptions about the content of a problem. It may also refer to the process of solving a problem or to earlier cases on which the problem itself has been raised. Reflection on past hypotheses is defined by the term critical reflection, and while reflection generally involves criticism, critical thinking refers only to the questioning of the validity of earlier learning assumptions and to the question of justification of the original reasoning and it is not related so much to how but to why of learning (Mezirow, 1990).

Boud, Keogh, Walker (1985, 2002) refer to thinking as a general context of activities in which the individual is engaged to explore his experiences and is led to a new understanding and assessment of phenomena.

Three levels are dominated by these activities:

(a) Return to experience, which means recalling important events, representing the original experience in the learner's mind and telling other key points of this experience.

(b) Approach of emotions, which has two dimensions: exploitation

of positive emotions and limitation of those who obstruct learning.

(c) Re-evaluation of the experience, which contains connection of new knowledge with that one already held by the trainee and incorporation of this new knowledge into his perceptual system.

Basic dimensions, which, according to Boud, Keogh, and Walker (2002), can contribute to reflection and improve its results are:

(a) association, that is, linking of new data to those already known,

(b) integration, which searches for relationships between data,

(c) validation, which recognizes the authenticity of ideas and emotions which have emerged and

(d) assimilation of new knowledge.

Mezirow (1991a) argues that critical thinking on the assumptions that have been implanted by the cultural context and often lead to dysfunctional behavior is a prerequisite for our more harmonized integration into reality. Based on this logic, he expresses the view that every adult is trapped within a set of assumptions and values, which are often false or dysfunctional, and therefore suggests that the ineffective, dogmatic views be turned off by the power of criticism and autonomy thinking. In Mezirow's work, incorrect or dysfunctional views are transformed through a critical distortions assessment of epistemic distortions, sociocultural distortions, and psychic distortions. In this perspective, the view of transformative learning is important. (Mezirow, 1990a, 1991a, 1998b, 1998c).

2. Interaction in Online Learning

An important element of modern online learning environments is their transformation into collaborative environments and places of intense social processes. In order to develop an online learning environment, a combination of interactions is required to achieve a common goal. Learners in online learning are in a different learning environment, making them more independent and in this sense capable of taking initiatives but also responsible for controlling their learning path. Under these circumstances, learning arises as a result ofinteraction, activation and initiatives that are developed (Anastasiadis, 2006).

Yacci (2000) in Boffiliou, (2013) states that interaction is a critical variable that needs to be clearly defined. In this context he makes a very analytical structural approach to the concept of interaction and defines it as a closed circuit where a message starts from an entity (man, machine or something else), directs to another entity and returns to the original, thus closing the circuit. Based on these data, there are four variables that affect the process of interaction: (a) interdependenceof messages of cognitive and emotional type, (b) duration of each message, (c amount of information contained in the message, (d)time between the sending of the message and the receipt of a reply.

Research data suggests that increased interaction leads to better learning outcomes (Koustourakis, Panagiotakopoulos, Lionarakis, 2003), although important questions are raised about the nature and extent of the interaction and its impact on the performances of the participants in an online course (Picciano, 2002).

3. The field of sensitization and change of attitudes towards the environment

The characteristics of education for sustainable development are based on the principles, values and dimensions of sustainability (society, economy, environment), promotes lifelong learning, it is values-oriented and refers to local environment and local cultures.

An important study by the Academy of Athens on Greece's energy prospects in 2050 shows that the energy sector may be a prerequisite for the growth of economy in the coming decades. This is a study by the Working Group of the Energy Committee of the Academy of Athens (Newspaper: "ToΒήμα", 2017).

The study states that the global energy landscape is experiencing a period of radical change where the role of consumers in Europe and around the world becomes essential and active. It is emphasized that these data will require large amounts of investment funds on interconnection networks, smart meters, vehicle storage and charging systems, other security and control systems and the required telecom and IT infrastructure. Achieving the goals will require people to support these prospects and for their(the citizens') own sake, they should be sensitized in this perspective. Of course, the field of awareness and change of attitudes towards the environment is really wide, as it starts from childhood and widens throughout life.

In this perspective important parameters are family, school and any form of formal, non-formal and informal education.

4. Design and implementation of the stochastic model

The online stochastic approach was based on the design of a four-step model (Planning, Organization, Application, Evaluation - P.O.A.E) (Panagiotidou, 2016).

In the first stage that is Planning the organizational framework, the target group identification, the diagnosis and assessment of potential problems, the description of the main purpose and individual objectives at the level of knowledge, skills, attitudes and metacognitive abilities were made. The expected results were recorded and the choice of the technological tool (software, e-learning platform) was decided.

In the second stage that is Organization, a number of topics were identified such as the timetable for the study and the implementation of the program, the identification of the material on the basis of the needs and the learning styles of the trainees (teachers) involved in the process as they (topics) were diagnosed in the previous stage.

In the third stage, implementation, everything was carried out according to the timetable of the previous stage. Here the predominant element was the stochastic processes as well as the interactions developed among the participants, the interaction with the trainers and the technological medium but also the interaction with oneself (reflection).The implementation took place in four stages (scenes).

In the first stage the teachers talked about themselves. They recalled positive and negative experiences and feelings they experienced as students, narrated their experiences as teachers and through all these they recorded their first thoughts as to how they imagine the school of the future. For this purpose, they had four main choices concerning environmental consciousness in relation to environmental interventions that could apply to school units, human relationships, teaching methodology, and educational administration.

In the second stage the participants were divided into four groups in order to elaborate and discuss the four different aspects of the subject.

In the third stage teachers studied the results of the work of all groups. They then met at the forum "Reflection" where they discussed about their previous experience and the new knowledge they acquired by interacting with their colleagues as they were thinking whether or not that knowledge is important to them and if, on the basis of this new knowledge, they will either revise their original view or not.

Finally, in the fourth stage, each participant in the project, regardless of the group he worked with, wrote a short essay proposing the school of the future as it meets his expectations but also taking into account the modern challenges using in his final proposition the verbs: "I conclude”, " I judge "," I Apply "," I Doubt "," I Refuse ", and" I Confirm”.

In the fourth stage, that is evaluation, the assessments of the process were collected and recorded. For this purpose, quantitative and qualitative analysis methods were chosen, ie questionnaires and interviews. The aim was to correlate with the initial objectives, record and analyze the impacts (positive and negative) and make decisions related to the continuation, repetition, or extension of the course.

5. Research data

5.1. Qualitative analysis of the discussions

The aim of the research was to investigate whether the implementation of the model in the process of e-learning involves criticalthinking, emergence and acceptance of different perspectives in approaching a subject and whether this can lead to transformation of false assumptions and change of attitudes.

Methodologically for the processing of the above research questions we examined the content of the messages exchanged in the fora with quantitative and qualitative criteria and data and we analyzed the interactions developed with the use of graph theory.

More specifically, in the first forum of the project, the participants talked about themselves, recalled positive and negative experiences and feelings they experienced as students, narrated their experiences as teachers, and through all these they recorded their first thinking about how they imagine the school of the future. For this purpose, they were given four directions if they wanted to choose one of them or to combine elements. One of these directions concerned environmental awareness with regard to environmental interventions that could apply to school units. The other three concerned human relationships, teaching methodology and administration of education.

In this debate 502 views were recorded, only seven of which referred to issues related to environmentallyupgradingschool units. However, after trainees having completed the course and following the stochastic and interactive processes developed in it, 170 new views and suggestions have been recorded. These views have connected the school of the future with environmental consciousness and awareness.

As far as the development of Environmental Awareness is concerned, it was proved the necessity for school not only to provide environmental knowledge but also to invest in changing attitudes and the development of metacognitive activities, through which the students will become active citizens taking relevant initiatives. To do this, today's students should have an emotional engagement in activities inside and outside the school environment and not just mere environmental knowledge.

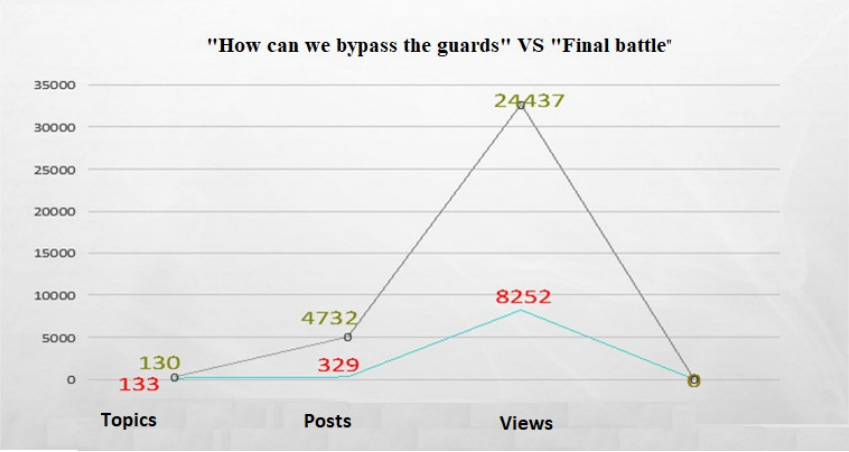
In this process the attitude of teachers, who should be sensitive to environmental issues, was considered important. Environmental awareness was referred to as a complex process involving both information and reformation of the behavior of a person or group on

environmental issues and problems. In this context, it was pointed out that the participation of teachers in experiential activities and in projects similar to this can contribute to the reformulation of their behavior and the change of false attitudes and assumptions.

At the same time, it was emphasized the adoption of more group rather than individual environmental actions, through which students will be interested in nature and its protection. These ideas have been recordeded and added to a sustainable school that meets the needs of the present without diminishing the ability of future generations of people to satisfy their own.

5.2. Quantitative analysis of the content of the messages exchanged

In Graph 1, we can see a comparison of participations between the forum "How can we bypass the guards" and the "Final Battle" forum. In the first the participants were asked to write a suggestion on how to avoid the guards, while in the second there was a real meeting with them as they appeared in the form as virtual participants interacting with the other participants.



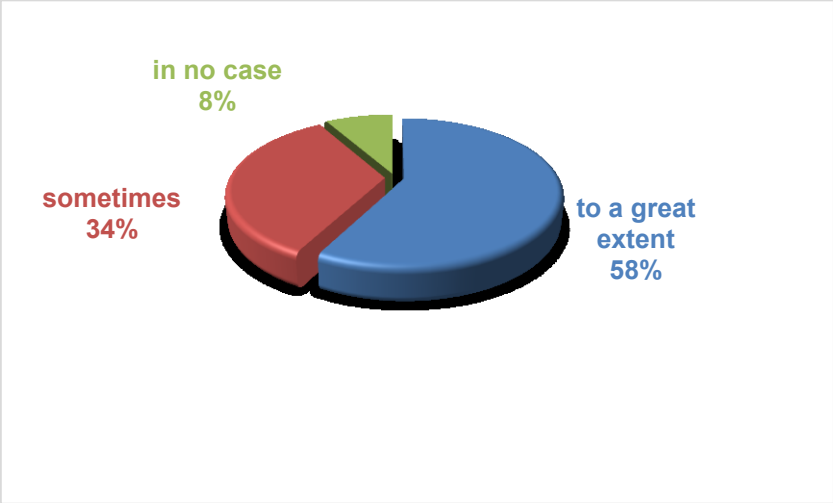
Graph 1. Comparative data between working fora

From the comparison of the data, it is clear that in both fora the same number of topics were opened (130 and 133 respectively), but the interest of the participants is particularly higher when the interaction is increased due to the presence of the virtual participants.

Thus, we notice that while in the forum "How can we bypass the guards" the posts amount to 329, in the forum "Final battle", they reach 4.732. Correspondingly, the data are also in the "views", ie the readings that demonstrate the interest of the participants in the process that evolves. So, in the forum "How can we bypass the guards" we see 8,252 views whereas at the "Final Battle" forum, they are launched at 24,437.

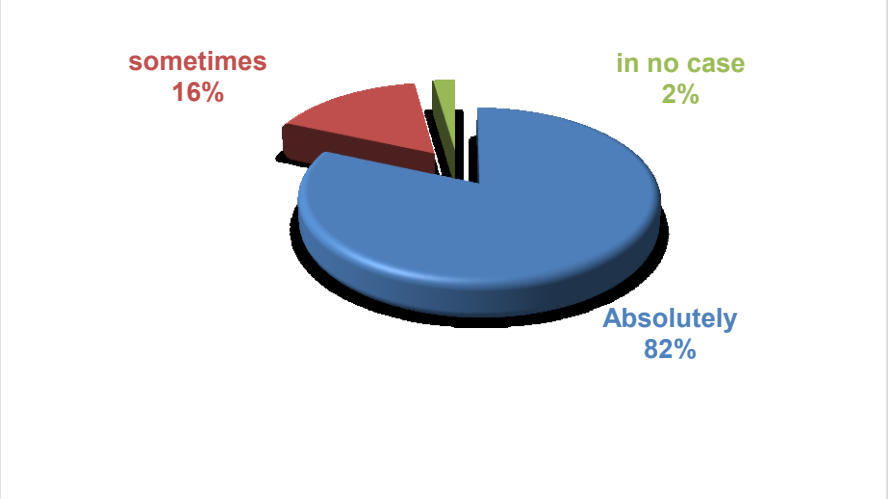
5.3. Evaluating views using questionnaires

The project was based largely on stochastic processes developed through reflective activities. This component, according to the participants, contributed to a great extent (58%) to the question of the validity of established perceptions and their mistaken assumptions (Graph 2).



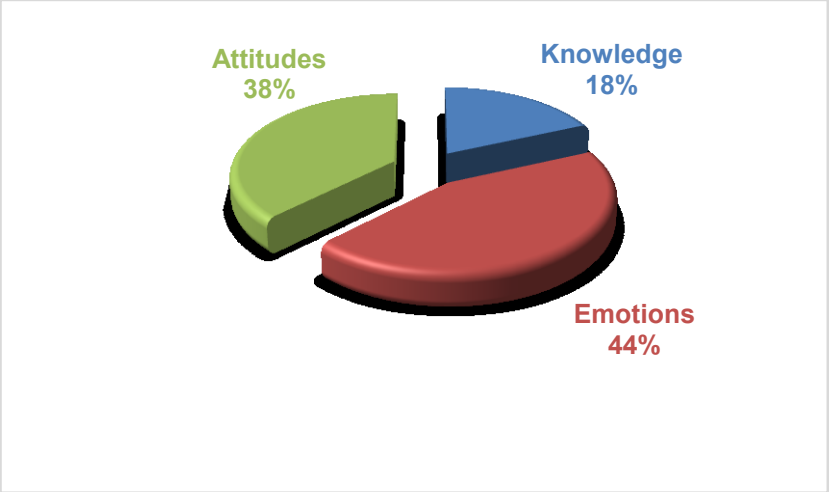
Graph 2. Dismissal of Valid Concepts and Mistaken Assumptions

Also, reflection contributed significantly (92%) to the reconsideration of established perceptions and values on the basis of which they understand and interpret reality about the environment (Graph 3).



Graph 3. Reconsideration of perceptions and values of understanding reality

Graph 4 shows the views on the achievement of the project's objectives. Forty four per cent(44%) of respondents believe that emotional goals have been more attained, 38% refer to change in attitudes, and 18% focus on cognitive goals.



Graph 4. Reconsideration of perceptions and values of understanding reality

5.4. Analysis of interactions with the use of graph theory

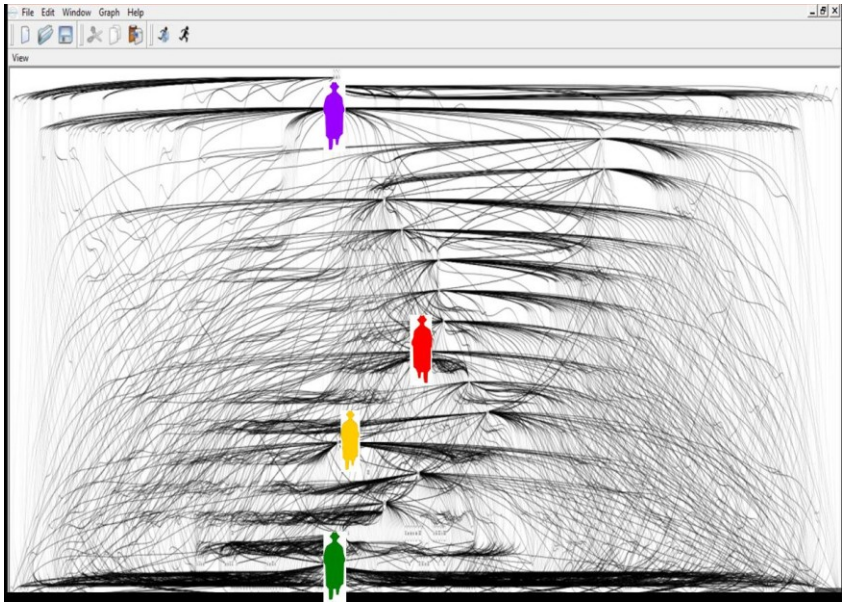
In order to analyze the content of the messages in details, the analysis of social networks was used as a method that synthesizes a theoretical background for understanding the structure of a network and the interactions developed within this network.

The study of social networks was carried out through the graph theory (Biggs, Lloyd, Wilson, 1986), where users appear as nodes of the graph and the edges correspond to the interaction between the users (of each node). The graph and graphical interface of AT & T (2017), which is an open source software and used to create and display graphs, was used to measure and display the graphs.

Graph 5 below shows a snapshot of the "Final Battle" network structure. We see an illustration consisting of a set of nodes linked to lines (edges), which essentially map interactions between the participants. In four points of the graph, four figures are shown indicating the starting points of the discussions (nodes).

The image analysis shows that the thickness of the edges (lines connecting the nodes) reveals the volume of interactions based on the number of messages, ie expressing the exchange of messages and thus relationships. The in-degree in the graph, that is, the number of edges ending in each node and the out-grade, that is the number of edges starting from each node, is large. Significant is also the degree centrality, as the sum of all the nodes that are directly connected to each other, as well as the closeness centrality which is the fact that the nodes are close to each other, an element which increases the interaction between the nodes.

Finally, the graph is characterized as connected in the sense that there is a path from each node to every other node, revealing the reciprocity of the exchanges.



Graph 5. Snapshot of the structure of the "Final Battle" net

Discussion and Conclusions

Theoretically, the study was based on the assumption that in adult education the interaction developed with reflective activities is a key component of the attempt to change established beliefs and dysfunctional assumptions by citizens.

Changing attitudes and dysfunctional assumptions on environmental issues is a lifelong process that in adults take on special and particular dimensions as they are often characterized by erroneous and dysfunctional environmental assumptions. In this context, they are highlighted by the utmost importance of principles and data concerning stochastic and transformational learning, which according to the theoretical framework of adult education can make a decisive contribution to this perspective.

From the analysis of the data it was found that Kolb's (1984) position is confirmed that if learning focuses on the problems resulting from the participants' experiences, it becomes more effective. The theoretical data of Boud, Keogh, Walker (1985, 2002) also confirm the theoretical data regarding the effectiveness of the stages that lead to reflection: returning to experience, approaching emotions and re-evaluating experience.

At the same time, the work in groups as well as the interaction they developed attributed particularly high levels of interaction that confirmed the effectiveness of the reflective interactive interaction model through Virtual Participants, while the parallel activities developed demonstrated that cooperative and creative learning techniques can be effective in online learning as well.

In general, as Yacci (2000) points out, interaction is also a critical variable in online learning. Koustourakis, et al. (2003) also argue that increased interaction leads to better learning outcomes. It has, of course, been found that the emotional aims of learning have been attained to a greater extent,contributing to the attempt of changing misconceptions and assumptions.

From the qualitative analysis of the messages developed became clear that the stochastic and interactive processes developed contributed to a great extent to the transformation of the attitudes of the participants who, at the last stage of the process, not only talk more about environmental issues but also show particular environmental awareness by making proposals.

The quantitative analysis of the content of the messages exchanged showed that the interest of the participants is particularly high when the interaction is increased, while the recording of opinions using questionnaires showed that through the use of stochastic activities the participants themselves question the validity of established beliefs and their erroneous assumptions.

Finally, the analysis of interactions with the use of graph theory demonstrated the high levels of interaction recorded in the discussions developed in the project.

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