THE CONTRIBUTION OF ENVIRONMENTAL & CULTURAL ROUTES TO ENVIRONMENTAL EDUCATION. THE CASE OF LAKE KARLA & MAYROBOUNIO (THESSALY/GREECE)

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Abstract
The pathways are an important point of reference, both at the national and local level, while they are the means of highlighting cultural routes. Therefore, proper planning is required, so that both the natural and the cultural wealth of the region can be highlighted.

Tthe quantitative analysis was implemented with the aim of investigating the opinions of the research participants, regarding the usefulness of the cultural pathway in the area of Lake Karlas - mavrovouniou, in central Greece. Also, it was investigated if a network of certified environmental and cultural routes (trails) in the area can offer opportunities for the development of environmental education and, by extension, sustainable development in the area, by attracting a significant number of local and foreign visitors.

Additionally, an environmental and cultural route was proposed, in the area of the study, through the application of GIS software.

In addition, GIS geoinformatics software was utilized for the design of the cultural route. In particular, the use of two different versions of the specific software was carried out, which are the ArcGIS Online, ArcGIS Education Edition (LearnGIS).

Keywords*: Lake Karla, Sustainability, Ecotourism, Pathways, Ecosystem services, Environmental education.*

Introduction

It is a multidimensional and very important contribution today, for local communities and of course the sustainable development of the countryside, the environmental and cultural routes (trails), since apart from the other purposes they serve, such as ecological ones, environmental education, nature protection etc., recreational activities are also added and in fact, necessary to a significant extent, for the very "stressed person", mainly in urban centers (Trakala, 2023).

Also, our cultural heritage, which is characterized by its particularly rich diversity, can become a driver of identity formation, social inclusion and integration, social reconciliation, peaceful coexistence and educational and economic development, can be known, through the paths (Vlizos and Pantzou, 2021).

Highlighting walking routes is a simple and direct way of reconciling today's man with nature. Through the paths, the visitor can enjoy his walk at the pace he wishes, as well as

change performances from the daily life of the city, while admiring the natural landscape (Vlastos, 2018, Ganatsas et al., 2015). Furthermore, it is a very creative occupation of free time, because through a group of people who take part in the same activity, personal bonds are created and consequently, the socialization of people develops (Sotiriou, 2019).

The term "environmental path" has been used in the educational process and teaching practice of P.E. in recent decades, without however having defined a fully accepted and official conceptual definition. Thus, as Politis (2019) mentions, according to the Cambridge online dictionary, the term environmental trail is described as "a path that crosses an outdoor area with the aim of stimulating the pedestrian's interest in issues of biodiversity and other elements" (Cambridge English Dictionary, 2019).

Another definition by Gana and Panagiotidou (2005), characterizes the environmental paths as "interesting points of nature (rich vegetation, water, waterfall), which give the idea for drawing the route..."

Hiking routes are the link between tourism, culture and environment by region, where the traveler can come into contact with the history, culture and sustainable development of local communities and the environment, the local tradition of the region, gaining awareness and responsibility for protecting the local ecosystem and its historical monuments, while undoubtedly, they can be a pole of attraction for visitors (Rodrigues & Kastenholz, 2007; Evans & Jones, 2011).

Hiking is a popular form of ecotourism, providing travelers with a sense of satisfaction and awareness of environmental sustainability (Poudel & Nyaupane, 2016). Furthermore, hiking is and is presented "as an interesting experience of association with the natural environment, through a well-planned network of paths (Sotiriou, 2019) and have a significant effect on the inner emotional world of people, while at the same time improving physical functions and the well-being (Gallis, 2019).

At the same time, the use of hiking trails by local residents contributes to the development of walking routes, highlighting longer and better routes, through specific destinations in their area (Joseph & Zimring, 2007).

A path or a network of paths must be designed with the main criterion of attracting visitors for hiking tourism. To this end, the natural ecosystems, the changing landscapes, the cultural monuments and attractions, arouse the interest of the visitors. The local communities must monitor, record the interest in the demand for hiking tourism in their area and promote and highlight them through various means and ways. The positive opinions of visitors, both in terms of infrastructure and service provision, is an important "advertisement" for the region. It is a fact that hiking visitors do not operate with the "criterion of luxury", but walk to escape from the difficult everyday life (Trakala, 2023).

Local development seeks social cohesion and requires individuals and communities to fully participate in social, cultural and economic events (Kollia, 2016). Each place certainly "hides" its special natural characteristics, its agricultural products, its local culture and its folklore tradition. All these elements constitute the development potential of each region, which must be highlighted and utilized with appropriate means (Muchnik & Anthopoulou, 2013).

Through the environmental and cultural routes, the majority of which are included in the "protected areas", a complex network of human possibilities is provided with many components, such as a field of action, education, creation, cultural expression, etc. (Flogaiti, 2011, 1998).

As mentioned in (Martinis et. al., 2015), as a result of research, the positive attitude of the local community towards the institution of protected areas and their impact on development is considered important. Sustainable development, revolving around natural and

cultural wealth, is seen as the only hope for the economic revitalization of today's degraded areas.

The development and promotion of environmental routes (paths) of a multi-thematic nature, in the wider area of Lake Karla, such as (biodiversity routes, collection of aromatic plants and herbs, chestnut, olive and almond fruits, wine mushrooms, etc., are of particular interest to the sustainable development of the region (Trakala, 2023, 2021).

In addition, the utilization of the flora, avifauna and fish fauna (Catsadorakis, 2019), in the area under study, will become a pole of attraction and multi-topic for environmental education, but also for alternative tourism, which has been widely recognized as a key tool for regional sustainable development.

Examples of sustainable activities for visitors include educational trails, hiking trails and climbing routes, as well as environmental activities based on local Culture (Martinis, 2020). After all, sustainable development is the common ground between the three components, i.e. environment, economy and society, which are also known as sustainability pillars. (Tsiaras & Tsiroukis, 2022). Of course, in order to achieve sustainable tourism development, the role of local communities is particularly critical, since local communities are more likely to accept tourism businesses that develop environmentally friendly actions, respecting the special local character of each region (Triantafillidou & Tsiaras, 2018).

It is considered a necessity now, the establishment and promotion of Environmental Education (E) in the local communities, so as to raise awareness of the importance of the conservation and rational management of the natural environment and to transform the citizens themselves into agents transmission of a new sustainable approach to local environmental issues (Karris et al., 2010). Thus, 'place'-based PE is natural, undirected, source-based achievement of learning within the immediate environment, in relation to the environment, for the benefit of the environment (Gruenewald, 2005; Morgan, 2009).

The inclusion of students in the life of the local community, attending decision-making processes, contributes to the assumption of active and constructive roles in them, when they later join society, as mature and responsible citizens (Gruenewald, 2008, Knapp, 2005, Woodhouse & Knapp, 2000).

"Environmentally literate" citizens become capable of acquiring a core of environmental knowledge, awareness, personal commitment, attitude and responsible action, while also including the economic, environmental and social dimensions of the issue (Paraskevopoulos, 2009). In fact, environmental education (EA) and education for sustainable development (SEA) are characterized as important tools, both for addressing knowledge, values and behavior, and for achieving sustainable development (Flogaiti, 2011). .

Characteristically, one of the parameters that influence people's attitude towards the environment, and thus their behavior, is their level of knowledge about important issues related to the ecosystem and protected areas. A higher level of education, environmental knowledge and environmental consciousness seem to be important characteristics that contribute to the goals of protecting and preserving the natural environment (Martinis, 2020; Newman & Fernandes, 2016; Genc & Akilli, 2016; Shamuganathan & Karpudewan , 2015; Teksoz et al., 2014; Gardner & Stern, 2002).

Moreover, through environmental education, it is possible to realize the value of the cultural path (trail) and adopt a higher degree of friendly behavior for animate and inanimate materials, of a place (Martinis et al., 2015, 2017; Minotou, 2012).).

Also, the sound walk along the environmental and cultural route (trail) provides the framework for active listening, analysis and understanding of the environment, focusing both on the physical characteristics of sounds and their meaning (Westerkamp, 2011; Minotou, 2012; Minotou et al., 2007).

Finally, at a pedagogical and didactic level, the vast majority of teachers consider that the contribution of the environmental path to education for sustainability and the environment is very great (Politis, 2019), while the pursuit of citizen awareness through modern educational tools and methods, can strengthen the local population, providing incentives to achieve sustainable development and strengthening the role of younger generations in shaping local, cultural alternative development (Folmer et al., 2002, Minotou et al., 2011).

1. Aim of the Research

The region of Lake Karla - Mavrovouniou is an ideal framework for the creation of environmental and cultural routes, effectively promoting the native natural and cultural heritage of the region. A key objective of this study is to explore visitors' perceptions and opinions about the conservation of biodiversity, cultural heritage and landscape in the area. Through the acquisition of such knowledge, this research seeks to facilitate the transformation of the area into a sustainable destination, offering valuable opportunities for environmental education and awareness programs aimed at both students and visitors. The ultimate goal is to promote the establishment of the region as a center of sustainable practices, preserving its natural and cultural assets, while acting as an environmental education platform for the formation of environmental responsibility and awareness for the protection of our natural environment and cultural heritage.

2. Methodology and Study Area

2.1. Cultural Route Using GIS

ArcGIS Online is a software or rather an online platform with a rich Graphical User Interface (GUI). The route is presented, as it was constructed within Learn ArcGIS, specifically in a Route layer (Route layer). The red "dot" (end) on the map coincides with the green (start), while the blue dots are the intermediate stations (Figure 1).

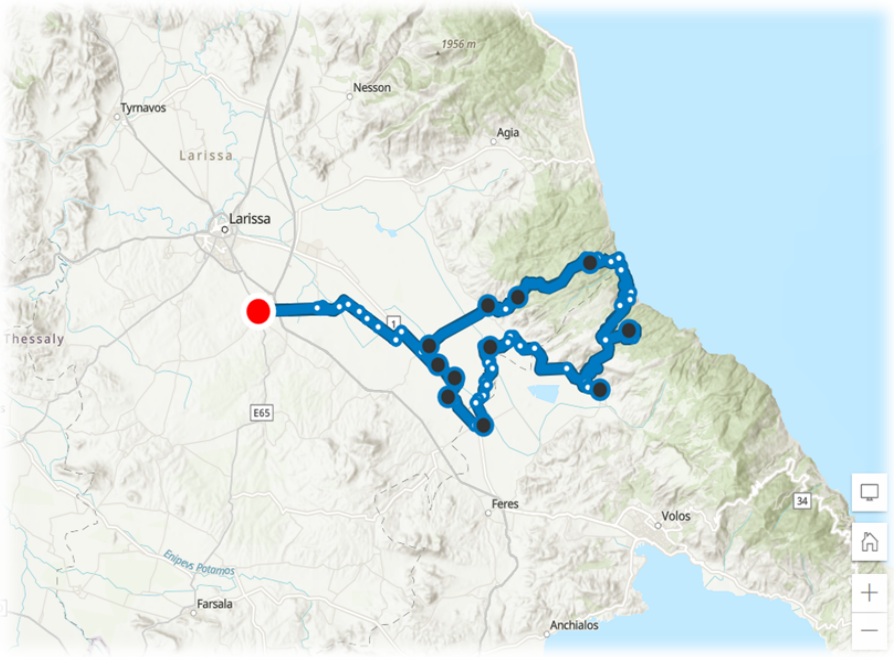

Figure 1. Path visualization in Learn ArcGIS

Some of the environmental education actions that can be implemented in the context of the planned cultural route are:

- ✓ Guided tours (Killeler).
- ✓ Wildlife observation (Kalamaki).
- ✓ Water resources management (Karla Lake).
- ✓ Ecological footprint (climate change-crisis).
- ✓ Familiarity with forest ecosystems (Sklithro).
- ✓ Tree plantings (Stephanovikio).

Overall, the proposed individual educational actions as well as other related ones aim to cultivate environmental sensitivity, environmental ethics and ecological consciousness.

The research part includes statistical analysis with questionnaires, that is, a quantitative analysis carried out with the main objective of examining certain research questions related to the perceptions of the participants regarding environmental education, as to whether it is possible to contribute to the sustainable development of an area, in particular of Lake Karlas, in the central Greece.

Totally 161 questionnaires were shared which consisted of the research sample. The participants in the research answered the questions which were included in the questionnaire provided that the voluntary character of participation and also their anonymity was made known. The participants expressed their opinions by completing the questionnaire, in the time period between September – November 2022, in electronic form (Google forms).

The questionnaire included questions on a five-point scale (Likert), where the degree of agreement or disagreement on certain topics related to the research is examined. the research questions that the research participants were asked to answer are the following:

1. What is the prevailing situation in the wider area of Lake Karlas - Mavrovouniou?
2. Can environmental education contribute to the sustainable development of the region?
3. What are the educational tools of Environmental education in the teaching practice?

Further questions investigated are the reason for visiting the area, as well as the degree of environmental interest of the participants. For the conduct of the statistical analysis of the data, the descriptive analysis and the interconnections analysis were used between the variables.

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3. Results

3.1 Quantitative analysis

No missing measurements were observed in both the demographics or the baseline part of the quantitative analysis. The demographics analyzed consisted of gender, age, education level, the reason for visiting the area and degree of environmental interest. The reliability analysis for the set of factors that are investigated, in terms of the main part of the analysis, as well as overall proved to be high (a=0,887). In fact, the greatest reliability was found in terms of personal experiences during the stay in the area, for the response to the information that existed about the area before the visit (a=0,887).

3.2 Visitors' profile

A grand total of 161 individuals took part in the research, comprising 84 females (accounting for 52.2% of the participants) and 77 males (making up 47.8% of the overall sample) (Figure 2).

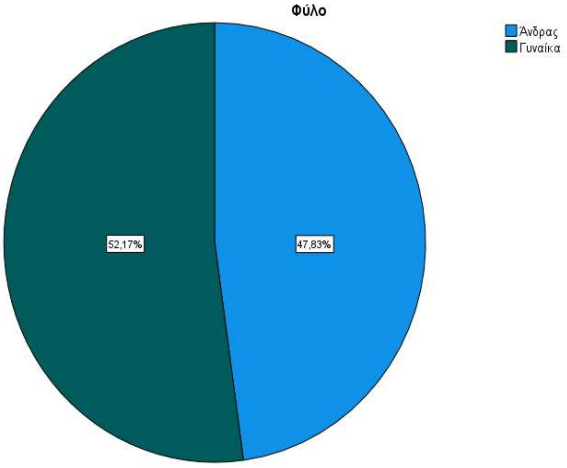

Figure 2: Distribution of participants by gender.

3.3 Age of visitors

In terms of visitor age, the predominant group consisted of individuals aged 21-30, constituting 52.8% of the entire cohort. Additionally, participants under the age of 20 accounted for 37.9% of the total sample. Notably, respondents from the over 40 age bracket comprised a mere 7.5% of the participants (Table 1).

Table 1: Demographic Data – Age

Age of participants					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<20	61	37,9	37,9	37,9
	21-30	85	52,8	52,8	90,7
	31-40	3	1,9	1,9	92,5
	41-50	12	7,5	7,5	100,0
	Total	161	100,0	100,0	

3.4 Level of education

In terms of educational attainment, the majority of participants in the study possessed a university degree, making up approximately 62.1% of the overall sample. Furthermore, 20.5% of the participants had completed high school, while 17.4% had attained a middle school education (Table 2).

Table 2: Demographic Data – Level of education.

Level of education.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Middle School	33	20,5	20,5	20,5
	High school	28	17,4	17,4	37,9
	University	100	62,1	62,1	100,0
	Total	161	100,0	100,0	

3.5. Correlations of variables

3.5.1. The x^2 criterion

The x^2 criterion is used to investigate whether certain parameters are influenced by demographic characteristics. Taking into account a confidence level α=5%, it is examined whether the questions under study are correlated or independent of gender, age or education level. The questions examined are independent of gender, because the p>0.05 condition applies. Thus, the answers of men or women are not the same, so they express different opinions. More specifically:

(The establishment of environmental education at all levels contributes to the achievement of sustainable development and environmental awareness). p=0.61 >0.05

(The area of Karlas - Mavrovouniu offers opportunities for environmental education through a local network of excellently organized trails). p=0.375>0.05

(Students can approach the environmental dimension (of sustainable development) of hiking trails). p=0.721>0.05

(Walking paths can be considered as an early level of development of ecological sensitivity). p=0.972>0.05

On the other hand, the question concerning the reconstruction of Lake Karlas in terms of providing opportunities for the development of networks, certified at the European level, in the wider area, depends on gender, because the p<0.05 condition applies (p=0.044 < 0.05). Therefore, the responses of the survey participants are identical, so women or men express the same opinions.

At the same time, it appeared that the questions under consideration are independent of age, because the p>0.05 condition applies. That is, the answers of the participants are not identical, even if they belong to the same age group, so they express different opinions. More specifically:

p=0.986 >0.05 (The establishment of environmental education at all levels contributes to achieving sustainable development and environmental awareness).

p=0.472>0.05 (The region of Karlas - Mavrovouniou offers opportunities for environmental education through a local network of excellently organized paths).

p=0.976>0.05 (Students can approach the environmental dimension (of sustainable development) of hiking trails).

p=0.593>0.05 (Walking paths can be considered as an early level of development of ecological sensitivity).

At the same time, it appeared that the questions under consideration are independent of the level of education, because the p>0.05 condition applies. That is, the answers of the participants are not identical, even if they belong to the same level of education, so they express different opinions. More specifically:

p=0.874 >0.05 (The reconstruction of Lake Karlas offers opportunities to develop a network of trails certified at the European level in the wider area).

p=0.672 >0.05 (The establishment of environmental education at all levels contributes to achieving sustainable development and environmental awareness).

p=0.82>0.05 (The area of Karlas - Mavrovouniou offers opportunities for environmental education through a local network of excellently organized paths).

p=0.59>0.05 (Students can approach the environmental dimension (of sustainable development) of hiking trails).

p=0.384>0.05 (Walking paths can be considered as an early level of development of ecological sensitivity).

3.6. Effect of demographic/individual characteristics on the questionnaire variable.

3.6.1. ANOVA analysis

ANOVA analysis is applied to test if there is a significant difference between the variables, at a significance level of 5%. Simple analysis of variance (ANOVA), in all other variables of the research questions, proved that there is no significant difference between the mean values, because the $p>0.05$ condition applies. Therefore, age and education level are not identified as significant influencing factors.

3.6.2. T-test analysis

The T-test method is applied to determine if there are statistically significant differences, with gender as the independent variable. The t-test, regarding the first research question, proved that gender is a significant factor for the variables "the reconstruction of Karla Lake offers opportunities for the development of a local network of European certified trails in the wider area" ($t= - 0.469$, $df=159$, $p = 0.007$), "the wider area of Lake Karla - Mavrovouni, has important ecological features and a rich cultural heritage" ($t= -0.239$, $df=159$, $p = 0.002$).

In particular, women have a higher degree of perception about the opportunities to develop a local network of European certified trails in the wider area, through the reconstruction of the lake (M.A.= 3.99, S.D. = 0.63), compared to men (M.A.= 3.94, SD = 0.8). Accordingly, women have a higher degree of perception of the ecological features and rich heritage of the wider area (M.A. = 3.99, S.D. = 0.611), compared to men (M.A. = 3.96, S.D. = 0.818).

In all other variables of the research questions, no significant difference was found between the mean values because the $p>0.05$ condition applies. Therefore, gender is not characterized as a significant influencing factor.

4. Conclusions

From the research where it was carried out, some current questions were studied, which must be taken into account by the competent management bodies of the area under study, with the aim of improving the provision of quality services and infrastructure to visitors.

The reliability of the research analysis was proved quite satisfactory, both overall and individually of all the factors under study, as the Croanbach α coefficient approached unity.

At the same time, regarding the correlations of the variables, all the questions under consideration are independent of the demographic characteristics, as the $p>0.05$ condition applies. An exception was the question concerning the reconstruction of Lake Karlas in terms of providing opportunities for the development of a network of pathways certified at the European level in the wider area, which depends on gender because the condition $p<0.05$ ($p=0.044<0.05$) applies.

Through the ANOVA method, it was shown that age and level of education are not characterized as significant influencing factors in the variables of the three research questions, because the $p>0.05$ condition applies and no significant difference was found between the mean values.

At the same time, with the application of the T-test method, it was shown that gender is an important factor for the variables "the reconstruction of Lake Karlas offers opportunities for the development of a local network of pathways certified at the European level in the wider area", "the wider area of the lake Karlas – Mavrovouniou, has important ecological characteristics and a rich cultural heritage", regarding the first research question.

In all the other variables of the two questions, as well as all the variables of the third research question, no significant difference was found between the mean values, because the

p>0.05 condition applies, therefore gender is not characterized as an important influencing factor.

Correspondingly, regarding the contribution of environmental education, in terms of achieving sustainable development and environmental awareness, most of the participants answered that they agree, at a rate of 46.6%, while also a percentage of 44.1% clearly agrees absolutely.

In addition, the research has some limitations, such as the sample of participants, which is considered satisfactory, but not very large.

Therefore, a future study may include a larger sample of participants to be more reliable. In addition, future research may include inquiries about pathways from different regions of the country or even abroad, in order to observe the differences or similarities between the research questions under consideration.

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