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Landscape Education at University: A Quasi-Experimental Study on the Effectiveness of an Outdoor Lab for Trainee Teachers

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Landscape Education at University: A Quasi-Experimental Study on the Effectiveness of an Outdoor Lab for Trainee Teachers

The European Landscape Convention of 2000 identifies landscape education as a fundamental action for the protection and enhancement of landscapes.

Pedagogical literature emphasizes that landscape education should aim to foster a positive attitude towards the landscape and should be pursued through education “in” the landscape, conducted via field-based experiential strategies. This study examines the impact of a landscape education approach on the attitudes of primary school teachers in training towards the landscape. A quasi-experimental study with pre-test and post-test was conducted, involving an experimental group (N = 102) in an outdoor digital storytelling lab and a control group (N = 114) in an indoor edition. Pre-test results showed no significant differences between the two groups in attitudes toward rural/natural landscapes, urban landscapes, and active engagement with the landscape. Post-test results revealed significant increases in scores only for the experimental group. These findings suggest that active, field-based landscape education can promote an appreciation of landscapes among future teachers. Future research should investigate whether teachers can promote similar attitudes in their students using analogous teaching strategies.

Keywords: landscape education; trainee teachers; outdoor lab; quasi-experimental study; attitude change

Introduction

Landscape in Europe and landscape education

In the last decades of the 20th century, Europe underwent rapid and profound landscape transformations. Accelerated urbanization, depopulation of inner areas, intensified agriculture, infrastructure development, changes in industrial practices, and the rise of mass tourism led to progressive homogenization and, in many cases, degradation of European landscapes. This situation threatened not only biodiversity but also the cultural identity of various European regions (Priour & Durosseau, 2006), raising

political and social concerns.

In response to these challenges, the international community recognized the landscape as a fundamental element for individual and collective well-being and as an expression of the diversity of common cultural and natural heritage. In this context, on October 20, 2000, the Committee of Ministers of the Council of Europe adopted the European Landscape Convention (ELC), also known as the Florence Convention (Council of Europe, 2000). The ELC marked a fundamental shift in the conception and management of the landscape in Europe, symbolizing a significant paradigm change. The political motivations behind the ELC are multifaceted and reflect a new vision of the landscape within the European context:

- landscape as a common good: recognizing the landscape not only as an aesthetic element but as a component of individual and social well-being (Olwig, 2007; Pantaloni et al., 2024);
- democratization of the landscape concept: moving beyond the idea that only exceptional landscapes deserve protection, including ordinary and degraded landscapes (Jones & Stenseke, 2011);
- harmonization of landscape policies: creating a common framework at the European level to overcome national disparities (Déjeant-Pons, 2006);
- promotion of public participation: actively involving citizens in landscape management and planning (Jones, 2007; Puskás et al., 2021);
- integration of landscape in sectoral policies: recognizing its transversal relevance in areas such as agriculture, urban planning, infrastructure, and tourism (Sassatelli, 2010).

Based on these new motivations and ideas, the ELC proposes a holistic view of all landscapes, including ordinary ones, to encourage a participatory culture where individuals take responsibility for their environment's quality.

This holistic and polysemic vision of the landscape is also highlighted by Naveh in 2001, who discusses "multifunctional landscapes" in the context of the Total Human Ecosystem perspective. Around the year 2000, the debate on the landscape brought forth its essential characteristics: the interaction between nature and culture (Naveh, 1995; Antrop, 1997; Antrop, 2000; Palang and Fry, 2003) and the continuous change produced by this interaction (Antrop, 2004).

Most of these concepts are essentially included in the definition of the landscape shared at the European level, as found in Article 1 of the ELC: "Landscape" means "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Council of Europe, 2000, Art. 1). The ELC also sets measures for member states to protect and manage landscape heritage, recognizing its cultural, environmental, social, and historical significance as part of European heritage and vital for quality of life.

The ELC is based on the reciprocal relationship between people and landscape, which entails individual rights and responsibilities in the protection, management, and planning of the landscape. To achieve these objectives, the ELC places great importance on landscape education in both formal and informal contexts: "school and university teaching which, in the relevant subject areas, address the values connected with the landscape and the issues concerning its protection, management, and planning" (Council of Europe, 2000, Art. 6, Para. B, Letter c).

To act on the landscape, it is first necessary to intervene on the population, building an attentive, responsible, and competent attitude, and learning to observe it by

developing the ability to listen to the unexpected and the unforeseen, leaving room for emotions and surprise (Castiglioni, 2010). Therefore, landscape education should not solely aim to transfer knowledge about the components, factors, and processes shaping landscapes. It should have a broader educational goal: to foster a positive attitude toward the landscape itself (Castiglioni, 2012; Busquets, 2010). This objective, consistent with the aim to encompass the inherent polysemy and interdisciplinarity evoked by the term landscape, can be achieved through a teaching methodology that implements education “in” the landscape, that is, to carry out educational interventions based on direct observation and experience within the landscape itself.

The interdisciplinary nature of landscape education is essential because the renewed focus on the landscape has engaged numerous disciplines. These include ecological approaches such as landscape ecology and biodiversity, geography, geology, geomorphology, history, archaeology, landscape architecture, landscape engineering, and landscape planning. Additionally, this new attention to the landscape has integrated social, economic, cultural, and political perspectives, making the ELC a crucial element for an interdisciplinary understanding of the landscape itself (Egoz, 2011; Antrop et al., 2013).

In the pedagogical realm, to encapsulate the inherent polysemy of the term landscape and its related disciplinary fields, it is insufficient to merely use the phrase “landscape education”; it is significant to use education “in” the landscape as it translates into educational interventions involving direct observation and experience within the landscape. Landscape education is, first and foremost, an “education to see”. “Seeing” does not simply mean looking at the landscape but learning to “read” it, decode its language, and understand the hidden meanings in every element (Ferrari, 2011; Měkota, 2024). The landscape is explored through the hermeneutic function

(Zanato, 2007), which implies decoding its signs using two complementary approaches. The first is direct perception through the senses, offering an immediate and tangible experience of the landscape, based on physical sensations. The second is cognitive processing, involving the analysis, reflection, and intellectual exploration of the landscape. This interpretive process leads to a deeper and more articulated understanding of the anthropic and natural aspects characterizing it, allowing for the grasping of the complex interactions between humans and the environment shaping the landscape over time.

Beyond the hermeneutic function, Zanato (2007) identified two additional functions of the landscape in education: the pragmatic or ethical function and the social function. The pragmatic function teaches students to manage, plan, and protect the territory, promoting awareness of the consequences of human actions and a sustainable approach. The social function fosters the development of local identities and openness to other cultures, stimulating intercultural dialogue, especially in migration contexts. Thus, the landscape becomes a ground for meeting and exchange, combining rootedness and openness, and contributing to the construction of inclusive societies aware of their cultural and natural heritage.

Internationally, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has advocated for the inclusion of Landscape Science as a subject in school curricula, integrating aspects related to sustainability and sustainable development (Zotano et al., 2010). Additionally, the Committee of Ministers' recommendation to member states on the guidelines for implementing the ELC states: "School curricula at various levels should foster an awareness of landscape themes through learning to read landscapes and through sensitisation to relations between *cadre*

de vie and landscape, to relations between ecology and landscape problems and to social and economic questions”. (Committee of Ministers, 2008).

The landscape, therefore, constitutes a valuable educational resource, offering students the opportunity to interpret the visible signs of their surrounding environment, delving into spatial planning issues. This reading of the landscape enables them to understand both historical and contemporary approaches to its transformation, revealing how the landscape itself expresses the identity of a community.

As observed by Cacciafoco (2021), contemporary research on landscape education is still heavily influenced by Euro-Western academic sources, largely due to the ELC, which primarily involves European countries.

In European schools, landscape education has been integrated into curricula in various ways. In Social and Natural Science courses, students learn about natural and anthropogenic landscapes (Gómez-Gonçalves et al., 2020). Drawings and questionnaires are used to help students recognize surrounding landscapes and to evaluate their opinions, experiences, and feelings toward these environments (Siama et al., 2018; Siama et al., 2020). Additionally, guided explorations are organized (Riesco-Chueca et al., 2013), and collaborative learning is promoted, including through web platforms that implement GIS technology. These technologies are also useful for encouraging participatory processes not only among students but also among citizens (Brown et al., 2014; Ruggeri & Fetzer, 2019).

This comprehensive approach to landscape education aims to develop a deeper understanding and appreciation of the landscape among students, fostering a sense of responsibility and engagement with their environment. By using a variety of educational tools and methodologies, educators can help students connect with the landscape in

meaningful ways, promoting both personal and collective stewardship of the environment.

The ELC and Landscape Education in Italy: An Overview

In Italy, the ELC was ratified in 2006, and since then, its impact on landscape education has been profound and varied. Promoting a holistic vision of landscapes as integral parts of daily life and well-being, the ELC has influenced Italian educational curricula (Zanato, 2007), teaching methodologies, and content, broadening landscape definitions to include cultural, ecological, and social aspects. This transformation is reflected in the integration of multidisciplinary courses encompassing geography, ecology, sociology, education, architecture, and urban planning, also impacting professional training programs for architects and landscape planners (Civitarese Matteucci & Cartei, 2022; Pătru-Stupariu & Nita, 2022).

Italian schools and universities have responded to the ELC by embracing an interdisciplinary and participatory approach. Educational reforms in Italy have incorporated landscape themes into geography and social studies courses, preparing students to understand the interactions between human activities and the natural environment from an early age (Crespo Castellanos et al., 2023). In this context, the training of future teachers is crucial to develop in new generations an awareness of the landscape's value and the ability to interpret it, recognizing its intercultural value, protecting it, and managing it sustainably (Cisotto, 2019).

Castiglioni (2017) highlights how the new conception introduced by the ELC has led to greater emphasis on landscape perception and active citizen involvement in its management, requiring an adjustment of training programs for a more interdisciplinary and participatory approach. The Italian Ministry of Education has revised school curricula to integrate landscape education into various disciplines,

including landscape-related themes not only in geography and natural sciences but also in art, literature, and civic education (Zanato, 2007; Castiglioni, 2010; Castiglioni, 2017).

The ELC has stimulated the development of innovative methodologies such as experiential and participatory approaches, field trips, citizen science projects, and the use of geospatial technologies in landscape education (Castiglioni, 2010; Castiglioni, 2017). The impact of the ELC on teacher training has been significant. A quick look at the study programs offered by Italian universities reveals the introduction of specific modules on landscape education in primary education degree courses, which include theoretical knowledge and practical skills, promoting interdisciplinary collaborations in landscape education. Furthermore, modules for the ongoing training of in-service teachers have been developed. These initiatives have led to richer and more diversified training paths for future educators, including modules on public participation, landscape governance, and interculturality.

Integrating landscape education into teacher training programs presents significant challenges, both in terms of content and teaching methodologies. However, obstacles remain in fully meeting the ELC's objectives. Specifically, it is essential to improve teacher training and develop educational materials that reflect the ELC's holistic and participatory approach. Additionally, continuous evaluation and adaptation of educational programs are crucial to ensure the full achievement of the ELC's objectives (Crespo Castellanos et al., 2023).

Background and research question

The quasi-experimental study that is the subject of this article is part of the T-place (Teaching Places, Building Community) project <https://www.t-place.unifi.it/>, a three-year project (2023-2025), funded by the NRP (National Research Plan) 2021-2027. The

project is conducted at the University of Florence and involves, from an interdisciplinary perspective, three departments: the Department of Education, Languages, Interculture, Literatures and Psychology (FORLIPSI); the Department of History, Archaeology, Geography, Arts and Performing Arts (SAGAS); and the Department of Civil and Environmental Engineering (DICEA). It aims to promote place-based education by developing a multidimensional and inclusive educational model. It uses cross-media tools such as eXtended Reality and 3D models to enhance knowledge of places. The project integrates Educational Technologies, Geography and Geomatics, considering the territory as a crossroads of human experiences and interactions. The conceptual pillars of the model are: education, which develops observational and analytical skills; documentation, with the acquisition of digital materials; and exploration, which involves field trips. This synergy of disciplines aims to create a cutting-edge educational model, which focuses on tangible and intangible cultural heritage, is being tested and implemented in a pilot project in Sesto Fiorentino, a municipality in the metropolitan city of Florence in Tuscany, an area of considerable interest because of its rich cultural heritage (Ranieri et al., 2023).

In the 2023-24 academic year, the University of Florence is launching a laboratory experiment in the Instructional and Learning Technologies course for future elementary school teachers. The goal is to develop skills in the use of technologies in educational processes, with a focus on digital skills and media literacy. The mandatory twelve-hour lab offers indoor and outdoor options for students to choose. The indoor lab takes place in the classroom and develops skills for managing digital storytelling in educational contexts, fostering self-representation, expression and civic activism. The

outdoor lab, in collaboration with the *Movimento di Cooperazione Educativa (MCE)*¹ - *History and Territory Group "Lando Landi"*, offers an opportunity for active education inspired by the Deweyan approach, valuing direct experience and discovery in the learning process (Dewey, 1963); it analyzes urban and territorial transformations through a multidisciplinary perspective (history, anthropology, geography, art), assessing whether human interventions are to be restored or preserved as cultural heritage. The outdoor lab is structured in six educational paths that explore and document the territory of Sesto Fiorentino, encouraging meaningful interaction with the environment.

Students chose one of six routes based on their interests, forming groups of 24 participants, then divided into subgroups to develop multimedia products (podcasts, videos, photographs). Each field trip is preceded by a two-and-a-half-hour online preparatory meeting to activate interest and provide information about the context to be explored, as well as to introduce the notions needed to produce the final product. During the outings, students explore the area with a hands-on and cooperative approach, making the audio, video or photographic recordings. The last hour is devoted to critical reflection and sharing of observations, to consider possible educational transfers of the acquired knowledge.

In summary, the outdoor lab proposes, for the training of future teachers, a landscape education experience consistent with the principles and strategies outlined by

¹ The MCE is an Italian educational movement promoting active, participatory learning methods. Inspired by Dewey's principles, MCE emphasizes democratic, inclusive education, focusing on collaboration, experiential learning, and the development of critical thinking and social skills in students.

ELC and the scientific literature on the subject. So, the study outlined in this article answers the following research question (RQ): can a teacher training experience carried out according to the principles of landscape education develop a positive attitude toward the landscape itself?

Method

Hypothesis and research design

To address this question, we tested the hypothesis that participants in the outdoor edition of the lab would develop a greater appreciation for the landscape compared to those in the indoor edition. We used a quasi-experimental design with a control group, dependent samples pre-test, and post-test (Cook et al., 1990; Christensen et al., 2011; Trochim et al., 2016). This design is not fully experimental because subjects were not randomly assigned to the experimental and control groups. Random assignment was impractical for organizing and teaching reasons: the lab had mandatory attendance with different schedules for the outdoor and indoor editions, requiring students to choose based on their availability. Additionally, students needed the freedom to select the edition that matched their interests. Given these constraints, a fully experimental design was not feasible. To increase internal validity, we used frequency distribution control method (Bailey, 2007) to ensure no significant differences between the groups in background variables such as gender, age, and ESCS (Economic, Social and Cultural Status, a measure of socio-economic and cultural conditions). This method enhances the comparability of the experimental and control groups by controlling for background variables, thereby isolating the effect of the independent variable: participation in either the outdoor or indoor lab.

Variables' measurement

Independent variable

The independent variable is the type of edition attended by the students in the Instructional and Learning Technology lab. The experimental group attended the outdoor edition, while the control group attended the indoor edition. Both editions aimed to apply knowledge on methodological orientations of educational technologies, understand digital competence in the school context, and design ICT-based educational interventions. The key difference between the editions is the educational approach: the indoor edition utilized a traditional university teaching approach in the classroom, whereas the outdoor edition employed an approach consistent with the landscape education strategies outlined in the introduction. To operationally define this approach, which constitutes the independent variable, we recall three landscape education strategies that were implemented in the outdoor lab.

First, interdisciplinarity (Egoz, 2011; Antrop et al., 2013): students engaged with content and practices typical of various disciplines. They oriented themselves using techniques from astronomy and geography; read historical texts or interviewed historians to reconstruct changes in the explored landscapes; analyzed monuments and buildings using architectural categories; visited archaeological sites guided by experts, and so on.

Second, the integration of landscape perception through the senses and cognitive reflection (Zanato, 2007): students immersed themselves in landscapes primarily using their senses, by observing the places and their characteristic elements (whether urban or rural/natural), listening to environmental sounds and expert or local testimonies. Based on these “sensory data”, they then developed reflections and analyses aimed at interpreting the places themselves, through the lens of human-environment interaction.

This cognitive processing also utilized digital tools, as each student group created a video, podcast, or curated photographic collection about the explored locations.

Third, the use of drawing and questionnaires to explore the landscape (Siama et al., 2018; Siama et al., 2020): students were often asked to draw the observed places or analyze them using prepared observation sheets.

These three strategies align with the principles of activism (Dewey, 1963), referenced by the MCE movement, which conducted the outdoor lab together with university instructors. Specifically, the following methodological principles were employed: active participation of learners, collective knowledge construction that requires and promotes collaboration, valuing diversity, practicing participatory democracy, and secularism.

The outdoor lab is characterized by teaching strategies consistent with these principles. Firstly, activities started from the students' interests: they chose from six territory routes based on their preferences. Secondly, during the routes, students worked in groups of eight and small groups of four. This collaboration aimed at creating a multimedia product that reworked the content of the chosen route, representing a collective knowledge construction that values diversity, as each student had a different role. Finally, each route concluded with a feedback session in a circle, where participants democratically discussed the route content and the adopted teaching choices.

Dependent variable

The dependent variable is the attitude towards the landscape, measured using a 13-item instrument (Scippo et al., *submitted*) that breaks this construct into three dimensions: 1) appreciation for rural/natural landscapes; 2) appreciation for urban landscapes; 3) inclination towards active landscape engagement. The first dimension is measured by

four items, such as “The countryside is an inviting place to visit” and “I find beauty in natural landscapes, with fields, woods, hedgerows, and meandering streams”. The second dimension is measured by five items, like “I find beauty in urban landscapes, with churches, historic buildings, squares, and monuments” and “I find inspiration in looking at a city's skyline”. The third dimension is measured by four items, such as “I participate in initiatives for landscape preservation” and “I seek information about the natural and human processes that formed a particular landscape”. For each item, students are asked to indicate their level of agreement on a scale from 1 (not at all) to 5 (completely).

The process of constructing the tool and its psychometric properties are detailed in Scippo et al. (*submitted*). In summary, the instrument was developed from a literature review (Fornara et al., 2016; Hull & Stewart, 1995; Park & Selman, 2011; Russell & Pratt, 1980; von Wirth et al., 2016) that, despite finding few existing scales, provided useful insights for defining the construct and formulating the items. An exploratory factor analysis conducted on data from an initial administration (N = 265) led to the definition of the three scales. A subsequent confirmatory factor analysis on a second administration (N = 274) confirmed the validity of the three scales, and Cronbach's alpha indicated good reliability for all three scales (values between 0.70 and 0.90).

Data collection and participants

An online questionnaire was created using an anonymous Google Forms module to gather information on the study's variables and was administered on two occasions².

² Participants were informed of their rights as research subjects in the study and consented to participate prior to submitting any data.

The pre-test was completed by 278 students between September 18 and 26, 2023, shortly before the labs began. The post-test was completed by 294 students between January 10 and 18, 2024, shortly after the labs concluded. The post-test included a question about which edition of the lab the student had attended (outdoor or indoor). To link pre- and post-test data, students were asked to create and remember an anonymous code for both administrations. After cleaning the data matrices, this code allowed for pre- and post-measurements for 216 students, of which 102 had attended the outdoor lab and 114 the indoor lab. Table 1 shows the demographic data (sex and age) and the ESCS index values, which measure socio-economic and cultural background conditions for each group.

[Table 1 near here]

Data analysis

To identify statistically significant differences between the two groups on discrete variables (age, ESCS, pre-test, and post-test), we first checked the normality of the distributions for each group using the Kolmogorov-Smirnov (K-S) test. If both distributions were normal, we used the T-test for independent samples to compare the groups; otherwise, we used the non-parametric Mann-Whitney U test. For the categorical variable sex, we employed Fisher's exact test. To compare pre-test and post-test differences within each group, we again checked for normality of distributions. If normal, the T-test for dependent samples was used; otherwise, the Wilcoxon signed-rank test was applied.

Results

According to the K-S test, the distributions of age, ESCS, and the three dimensions of landscape attitude measured in the pre-test significantly deviate from normal distribution for both groups (Table 2).

[Table 2 near here]

The background variables (age, ESCS, and sex) show no significant differences between the two groups: the Mann-Whitney test indicates no significant difference in age ($U = 5072$, $p = .092$) or ESCS ($U = 5367$, $p = .33$), and Fisher's exact test shows no significant difference in sex distribution.

Regarding the pre-test, the Mann-Whitney test reveals no significant differences between the two groups in any of the three measured dimensions: 1) Appreciation for rural/natural landscape ($U = 5573$, $p = .598$); 2. Appreciation for urban landscape ($U = 5519$, $p = .519$); 3. Inclination towards active landscape engagement ($U = 5670.5$, $p = .753$). This results mean that the students who followed the outdoor laboratory did not have a greater pre-existing interest in the landscape.

After confirming no significant differences in background variables and pre-test scores between the groups, we analyzed the pre-test and post-test differences for both groups. Due to non-normal distributions in the pre-test, we used the Wilcoxon signed-rank test (Table 3).

[Table 3 near here]

This test indicates that the scores in the three dimensions of landscape attitude significantly increased for the experimental group but not for the control group.

To explore the changes that occurred in the two groups on the various items, the difference between the post-test responses and the pre-test responses was calculated for each item (both responses indicated a degree of agreement ranging from a minimum of 1 to a maximum of 5). Then, the average of the differences for each item was calculated for each of the two groups (Table 4).

[Table 4 near here]

As expected, the differences between the post-test and pre-test in the control group were all very low, while in the experimental group they were all equal to or greater than 0.18. Specifically, six items stood out with differences of at least 0.26 points:

- (1) “I feel safer and more protected in the countryside than in the city” (0.46);
- (2) “I find inspiration when looking at a city's skyline” (0.32);
- (3) “I find beauty in natural landscapes, with fields, forests, hedgerows, and winding streams” (0.31);
- (4) “I like visiting cities I don't know” (0.31);
- (5) “I consider the landscape an integral part of a region's cultural identity” (0.26);
- (6) “I participate in initiatives to preserve the landscape” (0.26).

Discussion

As mentioned in the introduction, the European Landscape Convention advocates a holistic view of the landscape, identifying landscape education as essential for its

protection and enhancement. Methodologically, this education should be conducted “in” the landscape and, institutionally, should be promoted by school curricula (Committee of Ministers, 2008). In Italy, landscape themes are central to various disciplines in the primary education cycle, from Grade 1 (6 years old students) to grade 8 (13 years old students) (MIUR, 2012). However, despite the objectives set by regulations, individual teachers decide the emphasis on certain themes and the teaching methods. Pedagogical literature shows that teachers' attitudes significantly influence student performance and personality development (Blazar & Kraft, 2017; Ulug et al., 2011). The T-place project posits that primary school teachers who value the landscape can effectively interpret school curricula to foster similar attitudes in their students, emphasizing landscape themes as suggested by the ELC.

The results of this study indicate that an outdoor educational experience, conducted with active methods (Dewey, 1963), can promote future teachers' appreciation and active engagement with the landscape, whether rural, natural, or urban.

The score differences observed on individual items confirm this interpretation. The largest increase was seen in the item “I feel safer and more protected in the countryside than in the city”. To interpret this data, it is important to consider that most of the students who participated in the lab live in the city, lead student lives, and are likely not accustomed to excursions in rural or natural environments. The increased score on this item may indicate that students who participated in the outdoor lab somehow broke a barrier that previously separated them from experiencing natural or rural landscapes. The experience provided by the university took them to new places, into the historic center of a small town and in the countryside, leading them to feel more comfortable in these environments, perhaps even more so than in the city where most of them live daily. In addition, the second item with a significant increase (“I find

inspiration when looking at a city's skyline”) suggests that after participating in the outdoor lab, students have likely learned to see the city with new eyes. As Castiglione (2010) writes, landscape education opens up space for previously unseen things and new emotions. The students now seem more prepared to be surprised by familiar landscapes, to “see” them with new eyes, and to discern meanings that were previously hidden. This new ability to “see” and “read” landscapes is not limited to familiar urban landscapes but also extends to a curiosity about new cities to explore. It is no coincidence that another item with a significant increase in score is “I like visiting cities I don't know”. Finally, the last two items with a significant increase in score show how the outdoor lab appears to have contributed to achieving the objectives of the European Landscape Convention. First, students increased their agreement with the item “I consider the landscape an integral part of a region's cultural identity”. This indicates a heightened awareness of the deep interconnectedness between a territory and the communities that inhabit and transform it. Second, students increased their agreement with the item “I participate in initiatives to preserve the landscape” indicating that after participating in the outdoor lab, students' sensitivity towards landscape preservation has increased, which is indeed one of the objectives of the ELC.

In summary, the outdoor lab conducted as part of the T-place project seems to have fostered the development of a mindful and responsible attitude towards the landscape among the university students who attended (Castiglioni, 2010).

University students who become teachers are likely to replicate similar educational experiences with their future students, even in different territories. This hypothesis, however, needs long-term studies for verification. Two current data points support this hypothesis: the dependent variable measurement scale is not tied to the specific landscape of the outdoor lab but refers to landscapes in general. Additionally,

few of the 102 participants were from Sesto Fiorentino, indicating that students developed an appreciation for any landscape, not just the one where the outdoor lab took place. Therefore, it is reasonable to hypothesize that, once they become teachers, they can transfer the lessons learned to other territories and their own students.

Conclusions

The validity of this assertion depends on the internal validity of the study, which is limited due to the lack of random assignment of students to the two groups. However, this limitation is partially mitigated by verifying the equivalence of the two groups on background variables and the dependent variable before the educational intervention.

Another limitation of this study concerns external validity, due to the absence of random selection of the experimental group of students, which makes the sample unrepresentative and, consequently, the study's conclusions not generalizable.

In conclusion, it can be stated with a good degree of internal validity that the outdoor lab contributed to developing an attitude of landscape appreciation (rural/natural or urban) and a propensity for active engagement with the landscape among the university students who attended. The discussion of these results led to the hypothesis that these students, once they become teachers, will emphasize landscape themes in their teaching practice. In general, it is well-known that teachers' experiences, both informal/personal and formal educational, influence how primary school teachers approach geography with their students (Catling et al., 2010). Furthermore, experiences gained at university should ensure a didactic transfer to the broader population (Martínez-Hernández et al., 2024). In this case, teachers might be able to foster a similar attitude in their students through landscape education approaches similar to those they received at university. Long-term studies are necessary to verify this hypothesis. Future research could also

explore the correlation between attitudes towards the landscape and two additional variables identified by Zanato (2007) in his reflection on the three functions of the landscape in education: firstly, the tendency to undertake concrete actions for territorial protection; secondly, the development of local identities and the tendency to practice and promote intercultural dialogue.

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Tables

Table 1. Demographic and socio-economic-cultural characteristics of the two groups

		Lab	
		Indoor (control group)	Outdoor (experimental group)
Sex	F	N = 112	N = 100

		Mean	SD	Mean	SD
M	Age	26.64	6.73	Age	25.12
	ESCS	-0.09	0.37	ESCS	0.09
	N = 2		N = 2		
		Mean	SD	Mean	SD
M	Age	26	7.07	Age	21.50
	ESCS	0.31	0.12	ESCS	0.01
	N = 114		N = 102		
		Mean	SD	Mean	SD
Total	Age	26.63	6.70	Age	25.05
	ESCS	-0.08	0.37	ESCS	0.09
	N = 114		N = 102		
		Mean	SD	Mean	SD

Table 2. Results of the K-S test on age and ESCS

	Group	D	df	Sign.
Age	control group	.211	114	< .001
	experimental group	.329	102	< .001
ESCS	control group	.086	114	0.037
	experimental group	.351	102	< .001
Pre-test 1) Appreciation for rural/natural landscapes	control group	.097	114	.010
	experimental group	.120	102	< .001
Pre-test 2) Appreciation for urban landscapes	control group	.140	114	< .001
	experimental group	.114	102	.002
Pre-test 3) Inclination towards active landscape engagement	control group	.098	114	.009
	experimental group	.104	102	.008

Table 3. Pre-post differences in the two groups

Group	Attitude towards the landscape	Median		Wilcoxon test	
		pre- test	post- test	Z	p.
Control group (indoor lab)	1) Appreciation for rural/natural landscapes	3.75	3.50	-1.52 ^b	.129
	2) Appreciation for urban landscapes	2.80	3.80	-.09 ^c	.930

	3) Inclination towards active landscape engagement	2.75	3.00	-.52 ^c	.603
Experimental group (outdoor lab)	1) Appreciation for rural/natural landscapes	3.63	4.00	-3.23 ^b	.001
	2) Appreciation for urban landscapes	3.60	4.00	-3.44 ^b	.001
	3) Inclination towards active landscape engagement	2.75	3.00	-3.15 ^b	.002
b. Based on positive ranks.					
c. Based on negative ranks.					

Table 4. Pre-post differences in the two groups for each item

Scales and Items	Control Group	Experimental Group
1) Appreciation for rural/natural landscapes		
I find beauty in natural landscapes, with fields, forests, hedgerows, and winding streams.	-0.18	0.31
The countryside is an inviting place to visit.	-0.10	0.23
I find inspiration when looking at a natural landscape.	0.01	0.19
I feel safer and more protected in the countryside than in the city.	-0.10	0.46
2) Appreciation for urban landscapes		
I find beauty in urban landscapes, with churches, historical buildings, squares, and monuments.	-0.03	0.25
I like visiting cities I don't know.	0.14	0.31
I find inspiration when looking at a city's skyline.	0.09	0.32
When I visit a city, I try to understand its history.	0.04	0.25
I consider the landscape an integral part of a region's cultural identity.	-0.02	0.26
3) Inclination towards active landscape engagement		
I often take trips to admire natural landscapes.	0.18	0.25
I participate in initiatives to preserve the landscape.	0.01	0.26

When I see a landscape, natural or human-made, I wonder what it looked like in the past.	0.08	0.24
I seek information to understand the natural and human processes that have shaped a particular landscape.	-0.05	0.18
