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Sustainability in Education: Investigating Teachers' Confidence in Organising Learning Beyond the Classroom

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Abstract

Outdoor learning provides interactive, real-world educational experiences that extend beyond conventional classroom settings and encourage awareness of sustainability. This quantitative study seeks to evaluate teachers' competence in organising outdoor learning activities, contributing to a more engaging and meaningful educational experience. Adopting a relational survey design within a multi-survey model, the research involved 586 teachers from various subject specialisations working in public and private primary and secondary schools. The "Outdoor Learning Regulation Scale (OLRS)" served as the principal instrument for collecting data. Teachers' ability to organise and regulate outdoor learning was examined in relation to several variables, including gender, subject specialisation, previous online or face-to-face training in outdoor learning, the use of environments outside school for instructional purposes, childhood environment, and teaching location. The collected data were examined using statistical analysis to provide a detailed understanding of the factors associated with teachers' outdoor learning regulation competencies. The findings indicated no statistically significant differences in teachers' abilities to regulate outdoor learning according to gender, subject specialisation, childhood environment, or teaching location. However, significant differences were identified in relation to previous online or face-to-face outdoor learning training and the use of outdoor settings for teaching, offering further insight into the factors influencing teachers' effectiveness in facilitating outdoor learning experiences. Furthermore, the study highlights the relationship between outdoor learning and sustainability education. By developing teachers' competencies in managing outdoor learning, the research contributes to integrating sustainability into educational practice and encouraging students' ecological awareness and sustainable thinking. These findings underline the importance of professional development and focused training in outdoor education, with implications for enhancing sustainability-oriented teaching approaches.

1. Introduction

Traditional classroom-based teaching generally operates within organised educational settings and established curricula, whereas outdoor education extends learning beyond these conventional boundaries by offering interactive, engaging, and adaptable educational experiences (Taniguchi et al., 2005; Akarsu, 2025; Uslu Kocabaş and Cirik, 2025). Outdoor education, alternatively described as "outdoor learning," "environmental education," or "nature education," comprises learning activities conducted outside school buildings that fulfil curricular objectives through direct participation and practical experiences (Taniguchi et al., 2005; Eaton, 1998; Remmen and Iversen, 2023). In the context of this study, "outdoor education" specifically denotes formal, curriculum-based instruction undertaken in natural settings (e.g., school gardens, forests, beaches) as well as structured environments beyond school premises (e.g., museums, science centres, botanical gardens). This twofold approach demonstrates the educational diversity of outdoor learning and its potential contribution to advancing sustainability.

Outdoor education encompasses different disciplinary fields, including the arts, sciences, and physical education, while encouraging critical thinking, risk management, and holistic development (Akarsu, 2025; Gray and Martin, 2012; Wonowidjoyo, 2022). Previous studies have demonstrated its positive effects on students' emotional, cognitive, and physical development, particularly through greater engagement, improved well-being, and increased environmental responsibility (Akarsu, 2025; Uslu Kocabaş and Cirik, 2025; Kiviranta et al., 2024; Schroth, 2023; Smeds et al., 2011). Research conducted following the pandemic has additionally emphasised its contribution to mental health and renewed participation in learning activities (Sjöblom et al., 2023). By incorporating multisensory and experiential educational approaches, outdoor education responds to varied learning styles and supports the retention of acquired knowledge (Akarsu, 2025; Beames and Atencio, 2008; Kubat, 2018).

Nevertheless, conceptual uncertainties continue to surround the definition of outdoor learning, particularly as different educational settings, including museums, gardens, and playgrounds, are frequently considered under the same terminology (Remmen and Iversen, 2023; Beames and Atencio, 2008). These inconsistencies present challenges for implementation and teachers' understanding, reinforcing the importance of examining educators' readiness to facilitate outdoor learning. Effective outdoor education further depends on systematic planning, appropriate delivery, and evaluation, supported by sufficient professional preparation and training (Uslu Kocabaş and Cirik, 2025; Kiviranta et al., 2024; Kubat, 2018; Ergun and Çobanoğlu, 2017). Teachers consequently hold a fundamental role in this process, although existing research has identified limitations in their knowledge and preparedness (Akarsu, 2025; Bostan-Sarıoğlan and Küçüközer, 2017; Ertuğrul and Karamustafaoğlu, 2020). Furthermore, financial constraints, administrative challenges, and insufficient motivation represent additional barriers to implementing outdoor educational activities (Uslu Kocabaş and Cirik, 2025; Barrable et al., 2022; Çiçek and Saraç, 2017).

Teachers' individual backgrounds and professional experiences influence their approaches to outdoor education. Childhood experiences involving contact with nature can strengthen confidence, while professional education and training contribute to the development of pedagogical competence (Barrable et al., 2022; Blatt and Patrick, 2014; Legge, 2022). Outdoor education is also closely associated with sustainability, as it provides opportunities for students to engage with environmental challenges and develop responsible attitudes towards resource management (Schroth, 2023; Barrable et al., 2022). Teachers who possess knowledge of sustainability and appropriate outdoor teaching methods can establish connections between theoretical knowledge and practical experience, thereby preparing students to adopt sustainable ways of living (Jeronen et al., 2017; Timm and Barth, 2021).

In summary, outdoor education provides opportunities to enhance academic learning, emotional well-being, and environmental development. Teachers' competence is fundamental to its successful implementation and requires strengthening through structured professional development (Akarsu, 2025). To prevent conceptual confusion, the present paper differentiates between: (a) background research addressing the benefits and challenges of outdoor education, (b) theoretical foundations informed by experiential learning and sustainability frameworks, and (c) empirical studies examined

within the literature review. Accordingly, this paper initially presents the theoretical frameworks supporting outdoor learning, subsequently examines existing research and associated challenges, and finally outlines the methodology, findings, and implications of the present investigation.

1.1 Theoretical Foundation

The present research draws upon established theoretical perspectives associated with experiential learning and progressive education. A significant influence originates from John Dewey's pragmatist philosophy and the New School movement, which highlighted the importance of learning through direct experience and the relationship between individuals and their surrounding environments in creating meaningful educational experiences (Cincera et al., 2020). Dewey's educational perspective considers learning an active and context-dependent process rather than the passive transmission of information, providing a foundation for subsequent developments in outdoor and experiential education (Parry and Allison, 2020). Extending these theoretical principles, Kolb's experiential learning cycle (Kolb, 1984) describes learning through four interconnected stages: experiencing, reflecting, thinking, and acting. This recurring process emphasises the significance of practical involvement, reflective observation, conceptual understanding, and active experimentation, all of which are particularly applicable to outdoor educational settings. Collectively, Dewey's pragmatist approach and Kolb's experiential learning theory provide the theoretical basis for the present investigation. These perspectives position outdoor education as an experience-centred pedagogical approach, through which engagement with authentic environments contributes not only to cognitive development but also to social, emotional, and practical competencies.

1.2 Theoretical Background

Existing research indicates that outdoor learning applies experiential learning principles across diverse educational environments, enabling students to acquire knowledge while developing interpersonal and emotional competencies through direct engagement with real-world situations (Parry and Allison, 2020). Recent investigations (Legge, 2022; O'Carroll and Scanlon, 2023; Russo and Ceciliani, 2023) suggest that outdoor learning should be incorporated more extensively into educational practice because of its contribution to holistic development. Building upon earlier research, these studies establish connections between outdoor learning and sustainability education, highlighting its significance in developing students' environmental awareness and sense of ecological responsibility (Barrable et al., 2022). The relationship between outdoor learning and sustainability has received increasing academic attention, with Onge and Eitel (2016) identifying the contribution of outdoor educational experiences to students' energy literacy and understanding of sustainable living practices. Further research indicates that outdoor learning encourages environmentally responsible behaviours, systems thinking, and ecological awareness (Schroth, 2023; Hu and Mou, 2025). This relationship between experiential learning theory and sustainability education highlights the importance of incorporating structured outdoor learning programmes into contemporary educational curricula.

Extending this perspective, researchers increasingly recognise outdoor learning not only as an educational approach but also as a means of supporting wider sustainability objectives (Schroth, 2023; Hu and Mou, 2025). Through direct participation in natural environments, outdoor education promotes systems thinking, an understanding of ecological interdependence, and a sense of responsibility towards environmental stewardship (Schroth, 2023; Hu and Mou, 2025). These competencies are essential to sustainability education, which seeks to prepare students to become informed and responsible citizens capable of responding to complex global environmental challenges, including climate change and biodiversity loss. Consequently, the conceptual relationship between experiential learning and sustainability education provides a strong justification for integrating outdoor education as a fundamental element of education for sustainable development.

1.3 Sustainability, Out-of-School Learning and Teacher Education

The incorporation of sustainability into educational practice has gained growing importance as education systems worldwide increasingly acknowledge the necessity of developing students' knowledge, competencies, and values required for sustainable lifestyles (Barnes and Hoerber, 2013; Disterheft et al., 2013; Grosseck et al., 2019; Wamsler, 2020). This development emphasises the significance of out-of-school and experiential learning approaches as important mechanisms for sustainability education. Teacher education has a fundamental role in preparing educators to deliver such experiences and implement a comprehensive understanding of sustainability within educational practice (Wamsler, 2020; Şen, 2021). Learning beyond the classroom enables students to interact directly with environmental issues, supporting their understanding of ecological processes and sustainable approaches (Beames and Atencio, 2008; Fang et al., 2022; Mallette et al., 2025). Through direct interaction with natural environments, students develop critical perspectives on relationships between humans and the environment, including the responsible consumption and management of resources. Schroth (2023) emphasises that practical learning experiences in outdoor settings facilitate the understanding and internalisation of sustainability principles while encouraging lasting environmental stewardship through meaningful engagement with ecosystems and communities. Achieving effective sustainability integration requires teacher education programmes to address both sustainability-related knowledge and outdoor teaching methodologies. Educators possessing a comprehensive understanding of sustainability alongside appropriate pedagogical competencies are better positioned to involve students in meaningful educational experiences that encourage environmentally responsible behaviours (Timm and Barth, 2021). Training focused on outdoor educational approaches strengthens teachers' capacity to establish stimulating learning environments that promote sustainable thinking (Jeronen et al., 2017). Professional development initiatives should prioritise experiential learning, community participation, and critical thinking, consistent with the educational principles promoted by UNESCO (2017). The relationship between sustainability, out-of-school learning, and teacher education establishes a valuable foundation for advancing holistic educational approaches. Teachers' competence in embedding sustainability within curricula and effectively utilising outdoor learning settings is essential for responding to global challenges (Mallette et

al., 2025; Sterling, 2013). By involving students in immersive educational experiences grounded in real-world contexts, teachers strengthen the relationship between classroom-based knowledge and its practical application to sustainability. Ultimately, out-of-school learning and teacher education represent essential components of sustainability promotion. Effective professional preparation enables teachers to design meaningful and transformative educational experiences that support sustainable behaviours and practices. Through the development of environmental awareness using experiential learning approaches, students can be better prepared to respond to future sustainability challenges as knowledgeable and responsible global citizens.

2. Literature Review

A substantial body of research has examined the advantages and limitations associated with outdoor education. In contrast to the theoretical perspectives outlined in the preceding sections, this review presents existing empirical evidence that establishes the context for the present investigation. Previous studies, including those by Ayaydin et al. (2023), Buldur et al. (2020), Lugg (2007), and Monti et al. (2019), demonstrate the potential of outdoor education to support students' cognitive development and interpersonal skills. Nevertheless, several challenges remain, particularly concerns regarding safety, limited educational resources, and inadequate professional training (Legge, 2022; Russo and Ceciliani, 2023). More recent research, such as that conducted by Shume and Blatt (2019), has investigated the importance of teacher preparation in addressing these difficulties, highlighting the necessity of structured professional development initiatives that strengthen educators' competencies and confidence in incorporating outdoor learning into their teaching practices.

The relationship between outdoor education and sustainability has attracted growing academic interest in recent years. Research by Kiviranta et al. (2024) and Barrable et al. (2022) indicates that outdoor learning contributes not only to academic achievement but also to the development of environmental awareness. These findings emphasise its potential contribution to sustainability education. Existing research further suggests that outdoor learning can strengthen the connection between theoretical understanding and practical implementation by providing opportunities for students to participate in experiential, hands-on educational activities (Schroth, 2023; Barrable et al., 2022). Teachers consequently occupy a central position in supporting and facilitating these learning experiences. Recent investigations, including Cevher Kalburan (2024), suggest that educators who have received specialised training in outdoor education are more likely to apply these approaches successfully, reinforcing the significance of targeted professional preparation.

Furthermore, outdoor learning supports the objectives of sustainability education by allowing students to relate classroom-based knowledge to environmental challenges encountered in real-world contexts, including resource management, energy conservation, and biodiversity protection (Hu and Mou, 2025; Lugg, 2007). These experiences encourage environmentally responsible attitudes and behaviours that extend beyond formal classroom settings. Consistent with UNESCO's Education for Sustainable

Development approach, these findings highlight the international significance of outdoor education as both an educational methodology and a means of promoting sustainability.

2.1 Rationale

The increasing recognition of outdoor education as an influential pedagogical approach demonstrates its capacity to enhance students' educational experiences and support their holistic development. Nevertheless, evaluating teachers' competencies in organising and facilitating outdoor learning environments remains essential, given their fundamental responsibilities in planning, delivering, and evaluating these educational activities. Drawing upon the theoretical principles of experiential learning and sustainability education, together with the empirical evidence discussed in the preceding sections, this investigation addresses an important research gap by examining Turkish teachers' competencies in regulating outdoor learning across multiple dimensions. Educators' capabilities influence the quality and effectiveness of outdoor educational experiences, with implications for students' engagement, knowledge retention, and overall development. Furthermore, as sustainability education receives increasing attention, evaluating teachers' outdoor learning competencies becomes particularly important for supporting the development of environmentally aware and responsible future citizens.

The present investigation responds to an identified gap in existing research by assessing Turkish teachers' competencies in regulating outdoor learning across several dimensions. Although academic interest in outdoor learning has expanded, empirical evidence remains limited concerning teachers' preparedness to plan, implement, and evaluate outdoor instruction across different educational environments. Much of the existing literature concentrates on educators' attitudes and perceptions, providing comparatively less attention to measurable professional competencies. To investigate these relationships more comprehensively, the study examines particular teacher characteristics that may influence outdoor teaching practices, as reflected in the research questions presented below.

The selection of variables, including gender, subject specialisation, previous training, teaching experience, childhood environment, and teaching location, was informed by their potential relevance to understanding educators' professional practices. Previous investigations indicate that demographic characteristics and experiential backgrounds can influence teachers' attitudes and approaches towards outdoor education (Barrable et al., 2022; Legge, 2022). Gender was therefore considered to investigate possible differences in teaching approaches, while subject specialisation was examined to identify how different academic disciplines may influence outdoor educational practices. Previous training and teaching experience were included to explore the contribution of professional development to teachers' competencies in regulating outdoor learning. Similarly, childhood environment and teaching location were investigated to assess how early experiences in outdoor settings and current educational contexts, particularly urban and rural environments, may shape teachers' approaches.

Through the examination of these variables, the study seeks to develop a comprehensive understanding of the factors associated with outdoor learning regulation. It aims to clarify how educators

conceptualise outdoor education across different settings while informing targeted professional training and policy initiatives responsive to the needs of diverse teacher profiles. Investigating these dimensions provides valuable insight into how teachers' personal backgrounds and professional experiences relate to their capacity to facilitate outdoor educational activities. In addressing this research gap, the investigation also emphasises the importance of focused professional development and inclusive educational frameworks for strengthening outdoor learning practices and supporting more effective and sustainable education. Importantly, the study does not seek to establish causal relationships; instead, it examines associations and differences that may contribute to the development of more appropriately targeted teacher training and educational policy initiatives.

Based on these considerations, the study aims to assess teachers' competencies in organising outdoor learning, offering insight into their capabilities concerning knowledge, planning, implementation, and evaluation across different subject specialisations within outdoor education. To fulfil this objective, the investigation addresses the following research questions:

1. Does gender have a statistically significant influence on Turkish teachers' competencies in organising outdoor learning?
2. Do Turkish teachers from different subject specialisations demonstrate statistically significant differences in their competencies to organise outdoor learning?
3. Does the format of previous training (online versus face-to-face) significantly influence Turkish teachers' competencies in organising outdoor learning?
4. Does previous teaching experience in environments outside school significantly contribute to teachers' competencies in organising outdoor learning?
5. Is there a statistically significant relationship between Turkish teachers' childhood environments and their competencies in organising outdoor learning?
6. Is the geographical location in which Turkish teachers have taught (e.g., rural versus urban) significantly associated with their competencies in organising outdoor learning?
7. Are statistically significant differences observed in Turkish teachers' competencies in organising outdoor learning when the study's individual sub-factors are examined?

Although the research design encompasses a broad range of dimensions, this approach was selected to examine the diverse influences associated with outdoor educational practices. The findings are intended to provide wider insights that may inform more focused investigations in future research.

3. Materials and Methods

3.1. Research Design

The present investigation adopted a quantitative research approach to evaluate teachers' competencies in organising outdoor learning activities. Quantitative research involves reporting research findings through numerical information and measurable data (Hartas, 2015; Oral and Çoban, 2020). Consistent

with this methodological approach, the study employed a relational survey design within a multi-survey model. Survey-based research models are used to investigate relationships involving two or more variables (Berends, 2012; Büyüköztürk et al., 2020). The selection of this research design was appropriate for quantitatively assessing and comparing teachers' outdoor learning regulation competencies according to different variables. Quantitative investigations involve systematically gathering and analysing numerical information to identify patterns, associations, and statistically significant differences within the collected data. In the present study, numerical information was obtained through structured questionnaires administered to participants using an online survey platform, with the objective of evaluating their competencies in regulating outdoor learning across multiple dimensions.

3.2 Participants

The study involved 586 teachers representing different academic disciplines and employed in primary and secondary education across both public and private schools in Türkiye. Participants were recruited through convenience sampling, whereby individuals were selected according to their accessibility to the researchers. Questionnaires were distributed to teachers who could be reached, and participation was limited to those who voluntarily agreed to contribute to the investigation. Data collection was undertaken through an online survey platform, with recruitment facilitated by professional teaching networks, school administrators, and regional educational authorities. Teachers interested in participating accessed and completed the questionnaire voluntarily through the link provided. Eligibility criteria specified that participants must be actively employed as teachers in primary or secondary schools in Türkiye during the data collection period. Individuals who were not currently employed in schools, teachers on leave, and those working outside the teaching profession were excluded from participation. Table 1 presents the demographic characteristics of the participating teachers, reporting the corresponding frequencies and percentages. These data provide an overview of the principal demographic characteristics of the study sample.

The research sample comprised 586 teachers from different educational backgrounds, working across primary and secondary schools within both public and private educational institutions. Convenience sampling was adopted as the recruitment strategy, enabling the selection of participants according to their availability and accessibility. Questionnaires were distributed to accessible teachers, with inclusion in the study determined by voluntary participation. The sample size of 586 participants was informed by a statistical power analysis (power = 0.80, $\alpha = 0.05$, Cohen's $d = 0.5$), which indicated that the selected number of participants would provide adequate statistical power. Nevertheless, the non-probability nature of the sampling approach limits the generalisability of the findings to the wider teaching population. Accordingly, the results should be interpreted as reflecting the characteristics and responses of the participating teachers rather than as outcomes that can be directly generalised to all educators. To broaden the diversity of the sample, efforts were undertaken to recruit teachers from different subject specialisations, educational levels (primary and secondary), school types (public and private), and geographical regions. This approach sought to incorporate a broad range of professional perspectives

and teaching experiences. Despite these efforts, the findings remain representative of the participating group who fulfilled the eligibility requirements and voluntarily contributed to the research, rather than the entire population of teachers in Türkiye. Ethical principles were maintained throughout the investigation, with particular attention to protecting participants' anonymity and respecting their rights. The explicit identification of participant eligibility requirements and acknowledgement of sampling limitations provide greater transparency concerning the scope, interpretation, and applicability of the research findings.

Table 1. Demographic characteristics of the study participants.

3.3 Data Collection and Analysis Procedure

The present investigation utilised the Outdoor Learning Regulation Scale (OLRS), originally developed by Bolat and Köroğlu (2020), as its principal instrument for collecting research data. The OLRS evaluates teachers' competencies in regulating outdoor learning activities across four dimensions: information, planning, application, and evaluation. The instrument demonstrates a high degree of internal consistency, reporting an overall Cronbach's alpha coefficient of 0.99, while reliability coefficients for its individual sub-dimensions range between 0.95 and 0.98. These values indicate excellent internal reliability across the different components of the scale.

To establish the appropriateness of the OLRS for the participants included in the present investigation, additional assessments of its validity were undertaken. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy produced a value of 0.94, exceeding the recommended minimum of 0.80. Furthermore, Bartlett's Test of Sphericity yielded a statistically significant result ($\chi^2 = 5682.31$, $df = 406$, $p < 0.001$), indicating that the dataset was suitable for factor analysis. Exploratory Factor Analysis (EFA), conducted using principal component extraction and varimax rotation, identified a four-factor structure consistent with the original validation undertaken by Bolat and Köroğlu (2020). Each of the four extracted components demonstrated an eigenvalue exceeding 1, while examination of the scree plot revealed a distinct point of inflection following the fourth factor. Collectively, these components accounted for 57.8% of the total variance, suggesting an acceptable representation of the underlying constructs. Examination of the rotated component matrix revealed substantial and clearly differentiated factor loadings, with all items corresponding to their intended sub-dimensions and loading values exceeding 0.60. These findings provide evidence supporting the structural validity and multidimensional characteristics of the OLRS, reinforcing its suitability for examining teachers' competencies across separate yet interconnected aspects of outdoor learning regulation. The identified factor structure also provides a foundation for interpreting subsequent statistical findings and contributes to confidence in the study's conclusions. In the original instrument validation, Bolat and Köroğlu (2020) conducted EFA and established a four-factor model explaining 58.03% of the total variance. Confirmatory Factor Analysis (CFA) subsequently provided further evidence of construct validity, with reported model fit statistics of $\chi^2 = 496.34$, $p < 0.05$; RMSEA = 0.051; CFI = 0.96; and GFI = 0.91, indicating satisfactory model fit. To examine whether the original factor structure was maintained within the present sample,

individual item loadings and communalities were assessed, demonstrating consistency with the previously established structure.

The OLRS was initially developed in the Turkish language. To promote methodological transparency and enable assessment of the instrument's content and validity, an English translation of the scale, including representative items from each dimension, is presented in Appendix A. This version was prepared through a translation–back-translation process intended to maintain linguistic accuracy and conceptual equivalence. The instrument contains 29 statements assessed using a five-point Likert scale, with response options ranging from 1 (Strongly disagree) to 5 (Strongly agree). To facilitate interpretation, overall scores, ranging from 29 to 145, together with the corresponding subscale scores, were classified into three levels: low, moderate, and high. These classifications were applied to describe teachers' competency levels according to the OLRS scoring framework. The score boundaries used for each classification are presented visually in Fig. 1 to improve clarity. Although the overall and sub-dimension scores originate from the same instrument, they are reported independently to identify differences across specific competency areas, such as planning and evaluation, which may be relevant to professional teacher development. For example, an educator may demonstrate considerable competence in planning outdoor learning activities while requiring additional assistance with their practical implementation. Identifying these variations can support the development of targeted professional training and intervention strategies.

Figure 1. Classification of OLRS total scores into three competency categories: low, moderate, and high.

This approach is consistent with the theoretical organisation of the OLRS, which recognises outdoor learning regulation as a multidimensional construct. Although the classification thresholds were established through equal-interval divisions, a commonly adopted approach in educational assessment, the limitations associated with this method are acknowledged. Future investigations could therefore consider alternative, data-driven classification procedures, including cluster analysis or percentile-based thresholds, to achieve greater precision. Research data were obtained through structured questionnaires distributed to teachers working in different educational contexts. The questionnaire collected information concerning participants' demographic characteristics, professional teaching experience, and previous training associated with outdoor education. Teachers' competency levels were subsequently examined in relation to several variables, including gender, subject specialisation, previous training, engagement with outdoor learning environments, childhood background, and geographical teaching location.

The quantitative methodology adopted in this investigation was informed by established principles of survey-based research (Fink, 2003), with particular attention given to data preparation, descriptive and inferential statistical procedures, and visual presentation to support analytical accuracy and clarity. Although general methodological guidance for survey research was considered (Fink, 2003), the investigation does not claim to apply a distinct theoretical framework in the strict conceptual sense. Rather, the methodological approach reflects recognised practices concerning questionnaire

development, instrument validation, and statistical analysis. Accordingly, the research design is characterised by its methodological orientation rather than by adherence to a specific theoretical model. Statistical analyses were conducted using SPSS version 29. Tests of normality produced a statistically significant result ($p = 0.003$), suggesting that the data deviated from a normal distribution. Nevertheless, the observed skewness (-0.065) and kurtosis (-0.94) values indicated an approximately normal distribution, requiring further consideration of the analytical approach. Consequently, the findings were additionally examined using non-parametric procedures, specifically the Mann–Whitney U and Kruskal–Wallis tests. These analyses produced results comparable to those obtained through parametric testing, providing additional support for the consistency and robustness of the findings. Despite this, parametric procedures were retained for reporting purposes, consistent with approaches adopted in comparable educational investigations (Demir, 2022; Verma and Abdel-Salam, 2019). Descriptive statistical techniques were employed to summarise the collected information, while independent-samples t-tests and one-way analysis of variance (ANOVA) were used to examine differences between participant groups according to the research questions and relevant characteristics, including gender and previous training. To reduce the possibility of Type I errors arising from multiple statistical comparisons, a Bonferroni correction was implemented, adjusting the significance threshold to strengthen the reliability of the reported outcomes (Emerson, 2020). This adjustment reduced the probability of identifying statistically significant differences by chance and provided additional support for the robustness of the analysis. However, certain participant subgroups contained relatively small numbers of respondents. Statistical comparisons involving these groups were therefore interpreted cautiously, without extending the findings to the wider teacher population. Future investigations could employ stratified or quota sampling approaches to achieve more balanced representation across participant categories. Although non-parametric procedures, including chi-square tests, are appropriate for analysing categorical information, independent-samples t-tests and one-way ANOVA were selected because the present investigation focused on comparisons of mean scores, consistent with established approaches in educational research (Verma and Abdel-Salam, 2019). Given the multidimensional structure of the OLRS, both overall scores and individual subscale scores were examined to provide a more detailed understanding of teachers' competencies. Although this analytical strategy involved multiple statistical comparisons, the associated risks were addressed through the application of Bonferroni correction. The inclusion of several demographic and experiential variables was informed by previous research suggesting that such characteristics may be associated with teachers' competencies in regulating outdoor learning (Fägerstam, 2014; Mertoglu, 2023). Recognising the methodological balance between comprehensive investigation and analytical simplicity, future research is encouraged to consider more narrowly defined models or multivariate statistical approaches. The study's attention to instrument validity, reliability, and appropriate statistical procedures supports the credibility of its findings and contributes to understanding the characteristics associated with teachers' outdoor learning regulation competencies.

4. Results

The findings of the present investigation are presented through a series of tables detailing participants' demographic characteristics, overall scale scores, competency classifications, and the relationships and degrees of association observed among the examined variables. The following tables summarise teachers' competencies in regulating outdoor learning according to the dimensions measured by the instrument. Participants' competency levels were examined in relation to gender and their total scores on the Outdoor Learning Regulation Scale (OLRS). Table 2 presents the distribution of these results across the individual factors and the overall scale, including the corresponding frequencies and percentages.

The findings presented in Table 2 reveal descriptive variations in outdoor learning regulation competency levels between male and female teachers. Male participants demonstrated marginally higher scores within the information dimension, potentially indicating greater familiarity with the knowledge required for outdoor educational activities. Conversely, female participants recorded higher scores in the planning dimension, which may suggest comparatively stronger competencies in preparing and organising outdoor learning experiences. These descriptive patterns are consistent with previous investigations examining differences in teaching approaches (Dickson and Gray, 2006; Phipps and Claxton, 1997). Nevertheless, despite the observed variations, independent-samples t-tests identified no statistically significant differences between genders across any of the OLRS dimensions (all $p > 0.65$). These findings indicate that gender was not significantly associated with teachers' competencies in regulating outdoor learning within the present sample. Instead, professional experience and development opportunities may have greater relevance to the acquisition of these competencies. From an educational equity perspective, the results further suggest that teachers of both genders have the potential to implement outdoor learning effectively when appropriate professional preparation and support are available.

Overall, rather than identifying gender as a significant differentiating characteristic, the findings highlight the value of providing inclusive professional development opportunities designed to strengthen outdoor learning regulation competencies among all educators.

Participants' competency levels were additionally investigated according to their academic subject specialisations. Table 3 presents the distribution of teachers across the different competency dimensions and the overall scale, reporting the relevant frequencies and percentages alongside the corresponding analysis of variance (ANOVA) results.

Table 2. Gender-related differences in participants' competency levels and corresponding t-test findings across the OLRS dimensions.

Table 3. Distribution of participants' competency levels across teaching specialisations and OLRS dimensions.

Note

Percentages may differ slightly from 100% because of rounding. The symbol "-" denotes the absence of reported data for the moderate competency category within the corresponding factor. ANOVA statistics (F, p, η²) are provided for each dimension, with no statistically significant differences identified (all p > 0.05).

ANOVA findings: *Information: F(18, 566) = 1.29, p = 0.238, η² = 0.039; Planning: F(18, 566) = 0.94, p = 0.492, η² = 0.029; Application: F(18, 566) = 0.79, p = 0.632, η² = 0.024; Evaluation: F(18, 566) = 0.55, p = 0.838, η² = 0.018.*

Table 3 illustrates the distribution of teachers across low, moderate, and high competency categories according to their subject specialisations. To improve clarity, the findings are presented through broader descriptive patterns rather than an extensive discussion of each individual dimension. The descriptive statistics and one-way analysis of variance (ANOVA) provide an overview of the extent to which teachers' competencies in regulating outdoor learning differ across academic disciplines. Descriptively, teachers specialising in elementary education, social sciences, science, and guidance counselling demonstrated relatively higher proportions within the high competency category. These patterns may indicate that curriculum characteristics, instructional methodologies, or previous engagement with outdoor educational approaches within these disciplines contribute to the development of outdoor learning regulation competencies (Barfod and Bentsen, 2018; Gul et al., 2023). For instance, elementary and science teachers may encounter more opportunities to incorporate inquiry-based learning strategies, whereas guidance counselors may place greater emphasis on reflective practices and experiential educational activities. Nevertheless, the observed differences were not statistically significant (all p > 0.05). Consequently, although variations were evident at the descriptive level, subject specialisation was not significantly associated with outdoor learning regulation competencies within the study sample. These results are consistent with previous research suggesting that competencies associated with organising and managing outdoor educational experiences may extend beyond individual disciplinary boundaries (Ho et al., 2015; Lugg, 1998).

Participants' competency levels were also examined in relation to their previous participation in online or face-to-face outdoor education training, alongside their overall scores on the Outdoor Learning Regulation Scale (OLRS). Table 4 presents the corresponding findings, including group mean scores, standard deviations, and the results of independent-samples t-tests. To facilitate interpretation, the descriptive percentages are discussed in terms of general trends rather than providing a detailed comparison across every individual scale dimension.

Table 4. Participants' competency levels and corresponding t-test findings according to prior outdoor education training.

Note

Percentages indicate the proportion of participants classified into low, moderate, and high competency categories within each OLRS dimension. Independent-samples t-test findings revealed statistically

significant differences across all OLRS dimensions, with higher competency scores observed among teachers who had received prior training (all $p < 0.001$).

The findings presented in Table 4 reveal a clear and statistically significant association between previous outdoor education training, whether delivered online or face-to-face, and teachers' competencies in regulating outdoor learning. Participants who had received training demonstrated higher average scores and a considerably greater proportion of teachers classified within the high competency category. Conversely, teachers without previous training were more frequently represented within the low competency category, particularly in the planning and evaluation dimensions. Independent-samples t-tests identified statistically significant differences across all OLRS dimensions (Information: $p = 0.000$; Planning: $p = 0.000$; Application: $p = 0.000$; Evaluation: $p = 0.000$; Total: $p = 0.000$). Although effect sizes were not included in the table, the reported differences between trained and untrained participants suggest potential practical relevance beyond statistical significance. Several factors may contribute to these observed patterns. Professional training programmes frequently incorporate structured educational content that integrates theoretical knowledge with practical experiences, supporting the development of teachers' confidence and competencies in outdoor educational practice (Mertoglu, 2023; Barfod and Bentsen, 2018; Ho et al., 2015). Practical activities, familiarity with established educational approaches, and systematic guidance concerning safety procedures, classroom behaviour management, and sustainability principles may further enhance teachers' capacity to organise and regulate learning in outdoor environments. From the perspective of professional development, these findings highlight the importance of incorporating outdoor education training into both initial teacher preparation and continuing professional development programmes. Rather than depending exclusively on individual teachers' motivation, educational institutions and systems should establish structured opportunities for professional training. Such initiatives could promote more equitable access to the knowledge and competencies required for effective outdoor learning implementation. Future investigations could examine which training delivery methods, curricular components, and programme durations are most strongly associated with improved teacher competencies, thereby informing the development of more effective professional learning interventions.

Participants' competency levels were additionally examined according to their previous use of outdoor learning environments in teaching, together with their overall scores on the OLRS. Table 5 presents the corresponding results, reporting the frequencies and percentages of participants across the individual competency dimensions and the overall scale according to their experience of incorporating outdoor environments into educational practice. The descriptive and inferential findings consistently indicate a significant relationship between previous outdoor teaching experience and teachers' competencies in regulating outdoor learning. Educators who had previously conducted teaching activities in outdoor environments achieved higher mean scores and demonstrated substantially greater representation within the high competency category across all OLRS dimensions. In comparison, teachers without such experience were more frequently classified within the low competency group. Independent-samples t-tests confirmed statistically significant differences across all examined dimensions (Information: $p = 0.000$; Planning: $p = 0.000$; Application: $p = 0.000$; Evaluation: $p = 0.001$; Total: $p = 0.000$).

Table 5. Participants' levels based on their teaching experience in outdoor environments and outcomes of the independent samples t-test.

The findings indicate differences of both statistical significance and potential practical importance, suggesting that direct engagement with outdoor educational environments is positively associated with teachers' competencies in regulating outdoor learning. Educators who incorporate outdoor settings into their teaching practices appear to possess stronger abilities to obtain and interpret information relevant to outdoor pedagogy, organise effective educational activities, apply outdoor learning principles, and assess learning outcomes (Şen, 2021; Mertoglu, 2023).

More specifically, the higher scores observed in the information and planning dimensions may be associated with the contextualised, interdisciplinary, and experiential opportunities offered by outdoor educational settings. Similarly, stronger outcomes in the application and evaluation dimensions may suggest that practical outdoor teaching experiences encourage authentic inquiry, reflective learning, and critical thinking. From a theoretical perspective, the statistically significant differences further emphasise the relevance of incorporating experiential components into models of outdoor education pedagogy. Teaching in outdoor environments introduces educators to changing real-world circumstances that may strengthen adaptability, resilience, and creativity while enhancing their understanding of place-based and experiential educational approaches. These findings also have implications for teacher preparation and continuing professional development. Teacher education programmes should deliberately incorporate structured opportunities for outdoor teaching into both pre-service and in-service training, enabling educators to strengthen their professional competencies and confidence. Alongside pedagogical approaches, training should address safety procedures, behaviour management, and sustainability practices, supporting teachers in delivering outdoor learning experiences that are safe, engaging, and environmentally responsible (Şen, 2021; Mertoglu, 2023).

Participants' competencies were additionally examined according to the environments in which they spent their childhoods, together with their overall scores on the Outdoor Learning Regulation Scale (OLRS). Table 6 presents the distribution of participants across the individual dimensions and overall scale, including the corresponding frequencies, percentages, and independent-samples t-test results. The descriptive findings presented in Table 6 reveal certain patterns that may indicate possible relationships between childhood environments and teachers' outdoor learning regulation competencies. Participants raised in villages appeared to demonstrate marginally stronger results in the information, planning, and evaluation dimensions, whereas those who grew up in cities recorded slightly higher outcomes in application and overall competency. These tendencies may reflect differences in early environmental experiences, whereby rural childhood settings could support the development of organisational and evaluative abilities through direct contact with natural environments, while urban contexts may encourage adaptability, problem-solving, and access to diverse institutional resources. Nevertheless, the independent-samples t-test findings indicated that these differences were not statistically significant (all $p > 0.05$). Accordingly, although descriptive variations were identified, the results do not provide sufficient statistical evidence to conclude that rural or urban childhood

backgrounds systematically influence teachers' competencies in regulating outdoor learning. One possible explanation is that subsequent professional development, training opportunities, and practical teaching experiences enable educators to acquire the knowledge and strategies required for effective outdoor education, regardless of their childhood environments (Barfod and Bentsen, 2018; Ho et al., 2015). Furthermore, the growing availability of outdoor recreational facilities and environmental education initiatives in urban areas may contribute to narrowing differences traditionally associated with rural and urban childhood experiences.

Table 6. Participants' outdoor learning regulation competencies according to childhood residence: Descriptive statistics and independent-samples t-test results.

Overall, although the descriptive findings suggest possible differences associated with early exposure to different environments, the statistical results indicate that childhood background is not significantly associated with teachers' competencies in regulating outdoor learning. Professional preparation, institutional support, and individual motivation may therefore be more relevant to the development of these competencies. These observations reinforce the importance of strengthening initial teacher education and continuing professional development opportunities to ensure that educators from different backgrounds receive appropriate preparation for delivering meaningful and effective outdoor learning experiences.

Participants' competencies were further examined according to the geographical settings in which they carried out their teaching activities, together with their overall scores on the Outdoor Learning Regulation Scale (OLRS). Table 7 presents the distribution of participants across the individual dimensions and the overall scale, reporting the corresponding frequencies and percentages according to teaching location. The descriptive findings revealed that teachers working in rural areas demonstrated marginally higher scores in the information dimension, whereas those employed in urban settings recorded slightly higher results in planning, application, evaluation, and overall outdoor learning regulation. These variations may reflect the different educational opportunities associated with each context. Rural settings may provide greater access to natural landscapes and community resources, while urban environments may offer a wider range of institutional and cultural opportunities that facilitate educational planning and implementation (Alegre and Evangelia, 2022). Nevertheless, the independent-samples t-test findings demonstrated that none of these differences reached statistical significance across the OLRS dimensions (all $p > 0.05$). Accordingly, the results do not provide sufficient statistical evidence to suggest that geographical teaching location independently determines teachers' competencies in regulating outdoor learning. Instead, professional preparation, institutional resources, and pedagogical practices may have greater relevance than geographical context. The absence of statistically significant differences may also indicate that educators working in rural and urban settings are capable of adapting outdoor educational approaches to their respective environments. Teachers in rural schools may utilise nearby natural environments and community networks, whereas their urban counterparts may establish institutional partnerships and adapt outdoor learning activities to the characteristics of city settings.

Across both contexts, educators' professional knowledge, creativity, and capacity to exercise pedagogical judgement remain important for facilitating effective outdoor learning.

Table 6. Participants' competencies in regulating outdoor learning by childhood location: Descriptive findings and independent-samples t-test analysis.

Overall, the findings suggest that teachers' effectiveness in regulating outdoor learning is associated more closely with their professional competencies, practical experiences, and available support mechanisms than with their geographical teaching location. These observations further emphasise the importance of professional development programmes that recognise context-specific educational opportunities while strengthening the fundamental pedagogical competencies required for outdoor education. Such programmes should enable educators to make effective use of locally available resources, whether natural environments or institutional facilities, while simultaneously developing essential professional capabilities that remain applicable across different geographical settings (Alegre and Evangelia, 2022).

5. Discussion

The results of the present investigation offer important insights into the relationships between different characteristics and teachers' competencies in regulating outdoor learning. Through the examination of demographic and experiential variables, several patterns were identified that contribute to understanding how educators organise, implement, and manage learning experiences beyond conventional classroom environments. The interpretation of these findings is further supported by the reported psychometric characteristics of the Outdoor Learning Regulation Scale (OLRS). Factor analysis identified a four-dimensional structure encompassing information, planning, application, and evaluation, alongside a high level of internal consistency (Cronbach's $\alpha = 0.99$). These results provide evidence of the instrument's reliability and support the examination of teachers' competencies across theoretically distinct but interconnected dimensions.

Gender differences in outdoor learning regulation: The descriptive findings revealed minor variations between male and female teachers across the dimensions of outdoor learning regulation. Male participants generally recorded marginally higher scores in information, application, and evaluation, whereas female participants demonstrated slightly higher scores in planning. Nevertheless, independent-samples t-tests indicated that none of these differences reached statistical significance (all $p > 0.05$). Considering the established multidimensional structure of the OLRS, these findings suggest that gender was not significantly associated with any of the four principal competency domains examined in this study. Accordingly, the results do not identify gender as a statistically significant differentiating characteristic of teachers' outdoor learning regulation competencies. Instead, professional preparation, practical experience, and access to educational resources may be more relevant to educators' effectiveness in outdoor teaching. This interpretation is consistent with previous research emphasising the importance of avoiding essentialist assumptions concerning gender and

pedagogical practice (Neill, 1997; Mann et al., 2022). Although the present investigation adopted a binary gender classification in accordance with conventional demographic reporting, future research should consider more inclusive approaches that recognise the diversity of teachers' gender identities.

Variations across academic fields: Descriptive analyses indicated that teachers specialising in elementary education, science, social studies, and psychological counselling and guidance demonstrated relatively higher competency levels within certain OLRS dimensions. These tendencies correspond with previous investigations suggesting that such educational fields frequently incorporate experiential, interdisciplinary, and inquiry-oriented approaches that can facilitate outdoor teaching (Fägerstam, 2014; Mertoglu, 2023; Barfod and Bentsen, 2018). However, the one-way ANOVA findings demonstrated that differences between subject specialisations were not statistically significant (all $p > 0.05$). The identified four-factor structure provides a basis for examining these competency domains consistently across different academic disciplines. Although descriptive variations were observed, the inferential findings indicate that subject specialisation was not significantly associated with teachers' outdoor learning regulation competencies. This distinction is important because it prevents minor descriptive differences from being interpreted as systematic disciplinary effects. The findings further suggest that fundamental outdoor pedagogical competencies, including structured planning, safe implementation, and reflective evaluation, are relevant across subject boundaries (Ho et al., 2015; Lugg, 1998).

Impact of prior training in outdoor education: One of the principal findings concerned the relationship between previous professional training and teachers' competencies in regulating outdoor learning. Participants who had undertaken online or face-to-face outdoor education training demonstrated significantly higher scores across all OLRS dimensions (all $p = 0.000$). These results highlight the importance of professional development in relation to teachers' knowledge, confidence, and pedagogical capabilities for outdoor education. Given the factor structure identified through the instrument validation procedures, the observed differences can be examined across several interconnected competency areas rather than being restricted to a single dimension. These include acquiring relevant information, planning educational activities, implementing outdoor learning approaches, and evaluating educational outcomes. Professional training provides opportunities to engage with theoretical principles and practical strategies that may strengthen teachers' preparedness to design and manage outdoor educational experiences (Mertoglu, 2023; Ho et al., 2015). In response to these findings, teacher education programmes should prioritise three complementary areas: (a) combining practical outdoor teaching experiences with theoretical instruction; (b) incorporating training in safety procedures, risk assessment, and behaviour management appropriate to outdoor settings; and (c) integrating sustainability-related content that connects outdoor pedagogy with wider environmental literacy objectives. Furthermore, professional preparation should familiarise educators with different educational contexts, including urban, rural, formal, and informal environments, to support their ability to adapt teaching approaches across diverse settings.

Role of teaching experience in outdoor settings: The findings further demonstrated that teachers with previous experience of conducting educational activities in outdoor environments achieved higher scores across all dimensions of outdoor learning regulation. This association highlights the potential importance of direct teaching experience, through which educators engage with outdoor settings and develop practical approaches to supporting student learning (Şen, 2021; Fägerstam, 2014; Mertoglu, 2023). The four-factor structure of the OLRS enables these differences to be considered across interconnected competency areas, including subject knowledge, instructional planning, practical implementation, and evaluation. Previous research, including Fägerstam (2014), has similarly explored how sustained engagement with outdoor teaching can expand educators' understanding of its pedagogical possibilities, particularly in relation to student motivation, communication, and participation. Practical involvement in outdoor education may also encourage the development of professional creativity and adaptability as teachers respond to changing educational circumstances (Şen, 2021; Mertoglu, 2023). Fägerstam (2014) observed that outdoor teaching requires educators to navigate complex and unpredictable conditions, often demanding immediate adjustments to instructional methods and classroom management strategies. Such experiences can also broaden teachers' appreciation of the diverse educational opportunities offered by outdoor environments, complementing classroom-based instruction through experiential and multisensory learning.

These considerations reinforce the value of incorporating practical outdoor learning opportunities into teacher preparation programmes. The multidimensional structure of the OLRS further supports examining how different competency areas may develop alongside one another, particularly where practical implementation is accompanied by reflective evaluation. Research by Fägerstam (2014) indicates that teachers who engage in outdoor teaching may develop greater confidence in their instructional abilities while supporting positive educational experiences for students. Accordingly, incorporating practical outdoor teaching into teacher education may contribute to the development of competencies required to organise and manage learning across varied environments. Initial teacher preparation should therefore include structured field-based activities in both natural and built outdoor settings, allowing prospective educators to plan, deliver, and critically reflect upon authentic outdoor lessons before entering professional practice.

Influence of childhood environment on outdoor learning regulation: The descriptive results suggested that teachers who spent their childhoods in rural environments demonstrated marginally higher scores in information, planning, and evaluation, whereas participants raised in urban settings recorded slightly higher results in application. Nevertheless, independent-samples t-tests identified no statistically significant differences between teachers from village and city backgrounds (all $p > 0.05$). The absence of significant differences across the OLRS dimensions suggests that childhood environmental experiences may be more closely related to individuals' attitudes towards outdoor settings than to their measurable professional competencies. This interpretation is consistent with research highlighting the relevance of subsequent professional learning and practical educational experience (Cosco et al., 2014; Wells and Lekies, 2006). Although childhood exposure to natural environments may contribute to the formation of environmental attitudes and interests, professional preparation and teaching experience may be more

directly relevant to educators' abilities to organise outdoor learning. Existing literature supports this distinction by indicating that early engagement with nature can encourage environmental appreciation without necessarily providing the specialised pedagogical competencies required for outdoor instruction. For example, Wells and Lekies (2006) identified relationships between childhood experiences in natural environments and environmental attitudes in adulthood, while the development of professional teaching competencies requires additional consideration of structured educational preparation. Furthermore, previous investigations have highlighted the importance of formal training in supporting educators' effective integration of outdoor environments into teaching and learning activities (Cosco et al., 2014; DeBord et al., 2005). Consequently, the present findings reinforce the importance of continuing professional development in addressing potential differences in educators' backgrounds. Opportunities to strengthen outdoor learning regulation competencies should therefore remain accessible regardless of teachers' childhood environments, with targeted preparation and practical experience supporting their ongoing professional development.

Relevance of teaching location to outdoor learning practices: Comparable patterns emerged when participants were examined according to whether they taught in rural or urban environments. Descriptive results indicated certain context-related differences, with rural teachers recording slightly higher scores in information and urban teachers demonstrating marginally higher results in planning, application, and evaluation. However, none of these differences were statistically significant (all $p > 0.05$). The factor structure of the OLRS provides a consistent basis for assessing these competencies across geographical contexts, suggesting that educators' capacity to adapt their teaching practices may be more relevant than their location alone. This interpretation corresponds with the broader principle of adaptability in outdoor pedagogy. Research by Fägerstam (2014) illustrates how outdoor educational approaches can be implemented across different geographical settings through appropriate use of local environmental resources. Urban teachers may incorporate parks, gardens, and other accessible public spaces, while educators in rural settings may draw upon forests, rivers, and surrounding natural landscapes. Across these contexts, outdoor learning strategies can be adjusted to support student engagement and achieve intended educational objectives. Such flexibility demonstrates how outdoor pedagogy can respond to different environmental conditions without depending exclusively on a particular geographical setting.

Furthermore, Neville et al. (2023) emphasise that effective outdoor education depends not only on the characteristics of the available environment but also on educators' ability to connect these settings creatively with curricular objectives. Teachers working in different locations can therefore strengthen the educational potential of their surroundings by identifying suitable outdoor spaces that correspond with intended learning outcomes, whether situated in urban or rural areas (Neville et al., 2023). The findings suggest that pedagogical adaptability is an important consideration in outdoor learning regulation, enabling educators to utilise the resources and opportunities available within their particular teaching contexts. Future investigations could examine how teachers modify instructional strategies in response to different environmental conditions, providing further insight into the contextual characteristics of outdoor education across geographical settings (Jeronen et al., 2017).

Professional development and policy implications: Taken together, the findings demonstrate that although descriptive variations were identified according to gender, academic specialisation, and environmental background, statistically significant differences in outdoor learning regulation competencies were consistently associated with previous professional training and practical outdoor teaching experience. The multidimensional structure of the OLRS allows these associations to be considered across the broader range of regulatory competencies rather than as differences restricted to individual skills. These findings have implications for educational policy and teacher preparation. Greater attention should be directed towards providing comprehensive professional development opportunities and structured outdoor teaching experiences within both initial teacher education and continuing professional training. Such initiatives may strengthen educators' preparedness to incorporate outdoor pedagogy across different academic subjects and educational contexts (Sterling, 2013). At the policy level, this could involve establishing regular in-service training workshops, encouraging partnerships between schools and local communities to expand outdoor learning opportunities, and supporting interdisciplinary collaboration. These measures could contribute to embedding outdoor education more systematically within school curricula rather than positioning it as an optional or supplementary teaching approach.

The present investigation contributes to the expanding literature on outdoor learning by demonstrating that demographic and geographical characteristics were not significantly associated with teachers' regulation competencies within the examined sample. In contrast, previous professional training and practical outdoor teaching experience were associated with higher competency scores. The identified four-factor structure of the OLRS offers a useful basis for designing professional development initiatives that systematically address information, planning, implementation, and evaluation. As outdoor education becomes increasingly relevant to sustainability education, strengthening these competencies may help educators develop the confidence and practical capabilities required to facilitate meaningful experiential learning beyond the classroom. Future research should extend these findings through longitudinal investigations examining how teachers' competencies change over time in relation to continued training and practical experience. Comparative studies involving different geographical regions and educational systems could further clarify the roles of institutional resources, educational policies, and organisational support in shaping outdoor learning practices. Additionally, mixed-methods research combining quantitative analysis with qualitative investigation may provide deeper understanding of how teachers translate professional preparation into everyday educational practice.

6. Conclusion

The present investigation provided a comprehensive assessment of teachers' competencies in regulating outdoor learning and the characteristics associated with their development. By examining gender, academic specialisation, previous professional training, practical teaching experience, childhood environment, and geographical teaching location, the study offers detailed insights into how educators organise, facilitate, and manage outdoor educational activities. The interpretation of these findings is supported by the reported factor-analytical results. Exploratory Factor Analysis (EFA) identified a

coherent four-factor structure comprising information, planning, application, and evaluation, with factor loadings exceeding 0.60 and a high level of internal consistency (Cronbach's α = 0.99). These results provide evidence that the Outdoor Learning Regulation Scale (OLRS) reliably assesses the multidimensional characteristics of teachers' outdoor learning regulation competencies. Collectively, the four extracted factors accounted for 57.8% of the total variance, supporting the identification of distinct yet interconnected competency domains. This psychometric evidence strengthens the basis for interpreting the differences and associations examined across participant groups in the present investigation.

The findings demonstrated that childhood environmental background and current geographical teaching location were not significantly associated with teachers' outdoor learning regulation competencies, whereas previous outdoor education training and direct teaching experience in outdoor environments were significantly associated with higher competency levels. These relationships highlight the potential importance of practical, contextually situated educational experiences in supporting teachers' professional confidence and preparedness for outdoor instruction. Descriptive differences were also identified between male and female participants, with male teachers recording slightly higher scores in application and evaluation and female teachers demonstrating comparatively stronger results in planning. Similarly, educators specialising in elementary education, science, and social studies exhibited relatively higher competency levels within certain dimensions, potentially reflecting the experiential characteristics of these disciplines. However, these gender-related and disciplinary variations did not reach statistical significance. The identified four-factor structure offers further insight into how outdoor learning regulation competencies are distributed across different teacher profiles. For example, educators with previous outdoor teaching experience consistently demonstrated higher scores across all four dimensions, suggesting that experiential engagement may be associated not only with practical implementation and reflective evaluation but also with knowledge acquisition and instructional planning. This multidimensional perspective highlights the interconnected nature of cognitive, procedural, and evaluative competencies in outdoor educational practice. These findings reinforce the importance of professional development initiatives that respond to the different needs of educators across academic specialisations and demographic backgrounds while ensuring equitable access to training opportunities. Importantly, the investigation focuses on teachers' regulatory competencies rather than directly assessing student learning outcomes. Although improvements in student learning represent a broader educational objective, the findings emphasise the importance of first preparing teachers with the knowledge and practical skills required to plan, implement, and evaluate effective outdoor educational experiences. Furthermore, the study offers context-specific insights into the educational environment of Türkiye, where administrative requirements, including permission procedures, inadequate infrastructure, and curricular restrictions, may create obstacles to the wider implementation of outdoor learning. Recognising these institutional challenges is important for informing practical educational policy developments (Şen, 2021; Mertoglu, 2023). Addressing such organisational and policy-related constraints may contribute to establishing more supportive conditions for outdoor educational practice. Consistent with existing literature, the investigation acknowledges the potential of appropriately

designed outdoor learning activities to support students' cognitive, emotional, social, and physical development. Outdoor education can facilitate interdisciplinary learning, strengthen student engagement and knowledge retention, encourage environmental awareness, and promote inclusive educational approaches (Taniguchi et al., 2005; Remmen and Iversen, 2023; Bolat and Köroğlu, 2020). Nevertheless, the effective realisation of these educational benefits depends partly on teachers possessing the competencies necessary to organise and manage outdoor learning environments. Strengthening educators' capacity to incorporate outdoor experiences into formal curricula is therefore important for supporting academic development and sustainability-oriented attitudes among students. By providing further evidence concerning the psychometric properties of the OLRS through factor analysis, the study offers a useful assessment framework for subsequent research and educational practice. Policymakers and teacher educators may draw upon its four-dimensional structure when developing professional learning programmes that systematically address information acquisition, instructional planning, practical implementation, and reflective evaluation.

The implications arising from these findings concern two principal areas. First, educational authorities and institutions should give greater priority to incorporating outdoor education into teacher preparation curricula, particularly through experiential approaches connected to sustainability education. Second, continuing professional development initiatives should extend beyond theoretical instruction by incorporating practical, reflective, and collaborative learning opportunities that support teachers' confidence and adaptability across different educational contexts. Such initiatives may involve professional mentoring, peer observation, and structured field-based teaching experiences to strengthen the relationship between theoretical understanding and practical implementation. Despite its contributions, the investigation is subject to several limitations. The sample consisted of teachers working in Türkiye, which restricts the extent to which the findings can be generalised to other educational populations and national contexts. Furthermore, reliance on self-reported questionnaire responses introduces the possibility of response bias. Although the identified factor structure and high reliability coefficients provide support for the measurement properties of the OLRS, these characteristics do not eliminate the limitations associated with sampling and self-reported data. Future investigations should consider cross-cultural comparisons, adopt more representative sampling strategies, and employ longitudinal or regression-based analytical approaches to examine the relationships between different characteristics and teachers' outdoor learning competencies over time. Further research into the longer-term relationships between educators' professional competencies and student learning outcomes could also provide valuable evidence. By addressing teacher preparedness within the wider international emphasis on sustainability education, the study contributes to discussions concerning the effective integration of outdoor learning into contemporary educational practice. Subsequent investigations could additionally explore how geographical, cultural, and educational policy differences influence teachers' opportunities and capacities to implement outdoor pedagogical approaches, thereby contributing to comparative educational research.

Ultimately, the present study contributes to the expanding literature on outdoor education and sustainability by emphasising the importance of providing teachers with the professional knowledge,

practical experience, and institutional support required to facilitate learning beyond conventional classroom environments. The four-factor structure of the OLRS reinforces the value of comprehensive teacher preparation that addresses all principal dimensions of outdoor learning regulation, including information, planning, implementation, and evaluation, with the broader objective of supporting inclusive, engaging, and environmentally responsible educational experiences.

Declarations

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Informed Consent Statement: Informed consent was obtained from all participants involved in the original investigation. Participants received information regarding the research objectives, procedures, and voluntary nature of participation. Confidentiality and anonymity were maintained throughout the research process, and participants agreed to participate after receiving appropriate written and verbal information. No additional informed consent was required for the preparation of the revised manuscript, as no new participants were recruited.

Consent for Publication: The manuscript does not disclose identifiable personal information relating to individual research participants. All listed authors have reviewed and approved the submitted manuscript and consent to its submission for publication.

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Tables

Tables 1 to 7 are available in the Supplementary Files section.

Figures

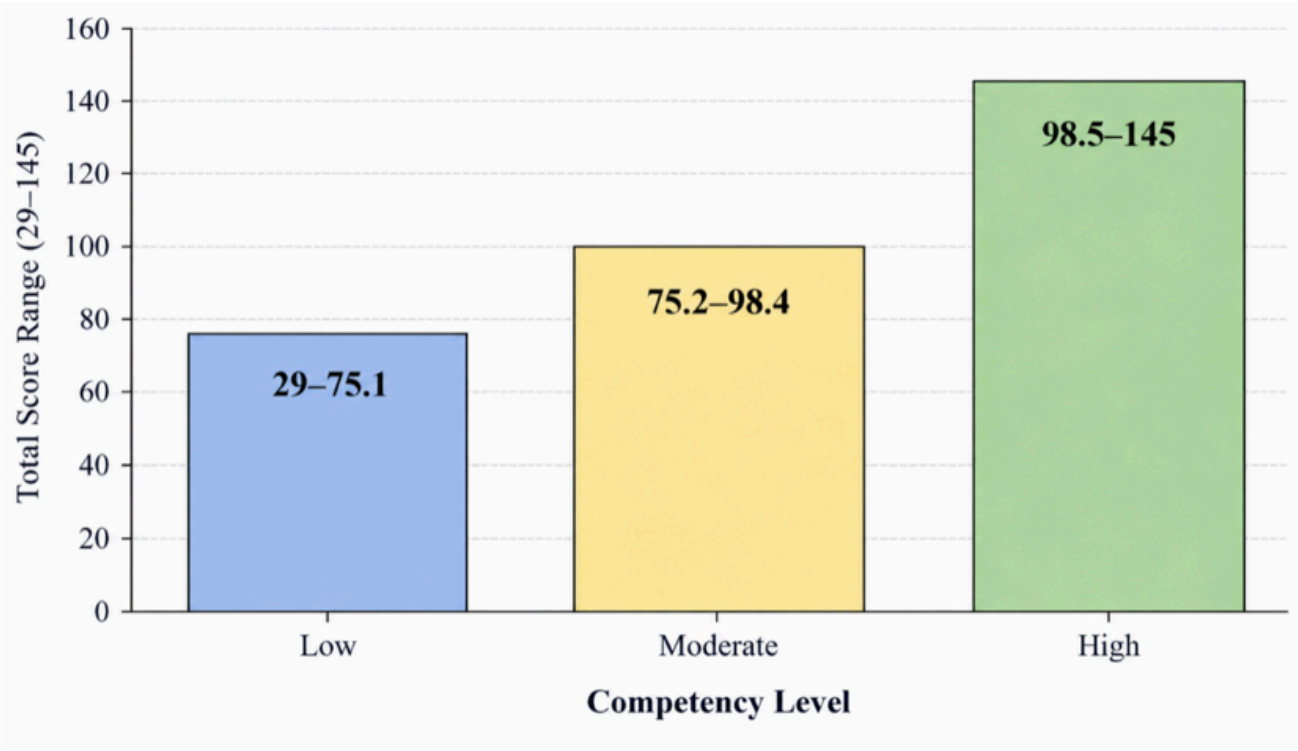


Figure 1

Classification of OLRS total scores into three competency categories: low, moderate, and high.

Supplementary Files

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- Tables.docx
- AppendixA.docx