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Attitudes and Views of Prospective Social Studies Teachers Toward Garden-Based Learning

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Abstract

The aim of this study is to determine the attitudes and views of prospective social studies teachers towards the garden-based learning approach. A convergent parallel mixed methods design was used in the research. The population of the study consisted of prospective social studies teachers, while the sample consisted of prospective social studies teachers studying at Afyon Kocatepe University. While 100 prospective social studies teachers were included in the quantitative component, 24 prospective social studies teachers participated in the qualitative component. The Attitude Scale Towards Garden-Based Learning Approach was used to collect quantitative data, while a semi-structured interview form was used to collect qualitative data. Prior to the inferential analyses, skewness and kurtosis values, Q–Q plots, residual diagnostics, and Levene's tests were examined to assess the assumptions underlying the planned statistical analyses. Independent-samples *t*-tests were used for two-group comparisons, with Welch–Satterthwaite adjusted results reported when the homogeneity-of-variance assumption was violated, and one-way analysis of variance (ANOVA) was used for comparisons across grade levels. Effect sizes and 95% confidence intervals were also reported. The significance level was set at 0.05. Content analysis was used to analyze the qualitative data. The study found no statistically significant differences in attitudes toward garden-based learning according to gender, sensitivity to environmental issues, or grade level.

Keywords: garden-based learning; social studies education; prospective teachers; sustainability; environmental education

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1. Introduction

Throughout history, humans have utilized natural resources to sustain their lives and meet their basic needs. However, population growth, industrialization, and technological advancements have led to increased use and consumption of natural resources, putting pressure on the natural environment and causing a diversification and spread of environmental problems. These resources, used unconsciously under the assumption of being limitless, have come at a heavy price for future generations. Environmental education has therefore become increasingly important for cultivating environmentally conscious, responsible, and aware individuals. To address these challenges, environmental literacy, agricultural literacy, and soil literacy education can be moved beyond traditional classroom settings through a model called "Garden-Based Learning", where students can learn by doing, experiencing, and observing, and engage directly with nature. The garden-based learning approach is fundamentally linked to constructivist learning theory. Constructivist theory argues that

individuals do not receive knowledge ready-made but actively construct it by interacting with their environment [1]. In the garden-based learning approach, students gain direct experience by doing, living, and observing. Thus, learning becomes permanent and meaningful. This approach aims to instill environmental awareness through concrete experiences rather than abstract theories, offering more lasting and meaningful learning opportunities. Especially in areas such as environmental, agricultural, and soil literacy, this model is considered a promising method for a sustainable future [2]. In the early 20th century in the USA, the importance of garden-based learning was emphasized [3], and many educational thinkers have recommended garden-based teaching in their studies [4]. In recent years, school gardens and garden-based learning have regained popularity [5]. Garden-based learning is an experience-based approach that enables students to learn through observation, practice, and research by directly interacting with their natural and immediate environment. In this respect, it can be associated with constructivist, experiential, and place-based learning approaches. These theoretical characteristics are consistent with the awareness, recycling, and research dimensions addressed in the study. It is expected that observations and practices carried out in the garden environment will develop awareness, while activities based on experiencing recycling processes and research will support these dimensions. In addition, gender, grade level, and sensitivity to environmental issues were considered as comparison variables in the study, as they are thought to create differences in attitude levels.

Research shows that garden-based learning increases students' awareness of nutrition and has positive effects on affective awareness, self-discipline, patience, motivation, academic achievement, teamwork, and attention span [6]. Students who engage in gardening have been observed to have improved overall academic performance and increased interest in learning [7]. Studies in this area also indicate that, in the early stages, garden-based educational practices provide an atmosphere of emotion and motivation, encourage the establishment and reinforcement of simple cause-and-effect relationships, and enhance children's artistic expression. Furthermore, at the secondary and university levels, it is stated that it significantly improves students' knowledge [8], and that at-risk students who participate in garden-based activities experience a significant decrease in school failure, a dropout rate, and a significant improvement in self-esteem and self-confidence [9]. Ohly et al. [10] showed in their study that student groups who were unsuccessful in classroom activities benefited from this method. Considering all these results, it can be said that garden-based learning produces positive cognitive, affective, and behavioral outcomes. The California Department of Education's Division of Nutrition Education and Training has summarized the situations in which the garden-based learning approach can contribute in five points. These situations are listed as: building bridges between school and community, encouraging the transfer of knowledge from one generation to the next, developing environmental awareness in students by caring for a living environment, providing opportunities for cultural exchange, and developing life skills [11]. However, the implementation of garden-based learning in educational settings can also bring various difficulties. In particular, insufficient time for implementation, limited teacher and staff support, funding and physical space requirements, and difficulties in integrating garden activities into the existing curriculum are among the main obstacles to the sustainable use of school gardens [12]. In addition, the limited knowledge and experience of teachers in planning and conducting garden-based activities can also make the implementation process more difficult. Therefore, when evaluating the educational potential of garden-based learning, the time, resources, teacher qualifications, and school conditions required for implementation must also be taken into consideration.

Garden-based learning, with its wide range of outcomes, and the applications based on this approach, are increasingly influencing educational programs [13]. Especially in Turkey, the reflections of these applications from the past to the present, and the trends in recent years, which are considered to overlap with free activity studies in primary school, life skills lessons, and social studies lessons in secondary school, will shed light on teachers who will implement such activities. Therefore, incorporating garden-based learning into social studies education can be considered an important necessity from both a pedagogical and social perspective. Social studies education conducted in traditional classroom settings often limits itself to transferring theoretical knowledge to students and fails to connect with real life. However, social studies lessons need experience-based learning experiences for individuals to acquire social participation skills, develop environmental awareness, and gain active citizenship consciousness. In this context, the garden-based learning approach, which offers alternative learning environments, supports students in interacting with nature, cooperating, taking responsibility, and developing awareness about the local environment [14]. Studies on garden-based learning in Turkey have been conducted with different sample groups and research objectives. Urey and Cepni [15] examined the effect of a science-based and interdisciplinary school garden program on the attitudes of fifth-grade primary school students towards Science and Technology in their experimental study. Tasci et al. [16] conducted a review study addressing the philosophical and theoretical foundations of the garden-based education approach. In a qualitative study conducted by Altan and Unaldı Eser [17], the views of geography teachers regarding the use of school gardens in geography education were examined. These studies show that garden-based learning in Turkey is addressed within the framework of different educational levels, sample groups, and research approaches. However, research specifically examining prospective social studies teachers' attitudes and views toward garden-based learning appears to be limited. In this context, determining the attitudes and views of prospective social studies teachers towards garden-based learning can contribute to filling this gap in the literature. To enable students to relate social studies lessons to daily life, develop environmental awareness, and actively participate in learning, constructivist approaches such as garden-based learning need to be further researched and implemented in educational settings. Social studies lessons, in particular, are directly related to this approach due to their inclusion of themes such as environmental awareness, social responsibility, local culture, and citizenship. However, the effective use of this method in educational settings primarily depends on the knowledge, attitudes, and beliefs of teachers—and therefore, prospective teachers—regarding this approach. Therefore, determining prospective teachers' attitudes towards garden-based learning is crucial both for the development of teacher training programs and for the more widespread use of this approach in social studies education.

In line with these explanations, the main objective of this research is to determine the attitudes and views of prospective social studies teachers towards the garden-based learning approach. Within the framework of this main objective, the following questions were addressed:

1. What are the attitudes of prospective social studies teachers toward garden-based learning?
2. Do the attitudes of prospective social studies teachers toward garden-based learning differ significantly based on gender?
3. Do the attitudes of prospective social studies teachers toward garden-based learning differ significantly based on grade?
4. Do the attitudes of prospective social studies teachers toward garden-based learning differ significantly based on self-reported sensitivity to environmental issues?

5. What are the views of prospective Social Studies teachers regarding the garden-based learning approach?
6. What are the views of prospective Social Studies teachers regarding the benefits of the garden-based learning approach?
7. What are the views of prospective Social Studies teachers regarding the limitations of the garden-based learning approach?
8. What are the views of prospective Social Studies teachers regarding the elimination of the limitations of the garden-based learning approach?

2. Materials and Methods

2.1. Research Design

A mixed-methods approach was used in the research. A convergent parallel mixed-methods design was employed, in which quantitative and qualitative data were collected within the same research period, analyzed independently, and subsequently integrated [18–20]. In the quantitative component, data were collected from 100 prospective social studies teachers to examine their attitudes toward garden-based learning and to compare these attitudes according to gender, grade level, and sensitivity to environmental problems. In the qualitative component, 24 prospective teachers who voluntarily agreed to participate were included in the interview study. Semi-structured interviews were conducted to examine their views regarding garden-based learning, its perceived benefits, its limitations, and possible solutions to these limitations. The two datasets were first analyzed separately according to their respective analytical procedures. Following the separate analyses, the quantitative and qualitative findings were brought together and compared in relation to the research questions. Convergence was considered when findings addressed similar aspects of GBL, complementarity when qualitative findings provided additional information not directly captured by the quantitative data, and divergence when the two sources differed in their patterns or implications. In this way, the integration focused on developing a more comprehensive interpretation of prospective teachers' attitudes and views toward garden-based learning rather than establishing causal effects. Because the qualitative participants were not purposively selected according to quantitative scores and the two datasets were not retained in a participant-level linked structure, integration was conducted at the aggregate findings level rather than through within-case comparison.

2.2. Participants and Sampling

The study's working group consists of prospective teachers studying at a university in the Aegean Region of Türkiye during the 2025–2026 academic year. Data were collected between 15 March and 15 April 2026 during the spring semester of the 2025–2026 academic year. Prospective social studies teachers were invited to participate in the quantitative data collection, and 100 prospective teachers participated in the study. Among these 100 participants, 24 prospective teachers who voluntarily agreed to participate in the interviews were included in the qualitative study group. Thus, the 24 participants in the qualitative study group were also part of the quantitative sample. No additional stratification or selection was conducted according to participants' quantitative scores, grade level, or sensitivity to environmental issues. Therefore, the qualitative sample represents a second stage of voluntary self-selection within the quantitative sample rather than a purposively stratified subsample.

Participants were selected using convenience sampling, a type of non-probability sampling that allows researchers to work with readily accessible groups and is frequently preferred in educational research [21]. The quantitative study group consisted of 66 female (66%) and 34 male (34%) prospective teachers. In terms of grade level, the participants

consisted of 20 first-year, 34 second-year, 28 third-year, and 18 fourth-year prospective teachers. The qualitative study group consisted of 24 prospective teachers, including 12 female (50%) and 12 male (50%) participants. The ages of the prospective teachers ranged from 18 to 24 years. Participation in the research was voluntary, and the inclusion criteria were being enrolled in the social studies teacher education program and voluntarily agreeing to participate in the research. Information regarding prior garden experience, previous exposure to garden-based learning, and prior environmental training was not systematically collected in the study. Therefore, the potential effects of these characteristics on group comparisons could not be examined and were considered when interpreting the findings. The quantitative study group consisted of 100 prospective teachers. This sample size was determined based on the accessible population and the prospective teachers who voluntarily participated in the data collection process; no a priori power analysis based on a prespecified minimum effect size was conducted. Therefore, the quantitative component of the study should be considered exploratory with respect to detecting group differences. The relatively small and unequal number of participants in some subgroups, particularly by gender and sensitivity to environmental issues, was taken into account when interpreting the group comparisons. Accordingly, statistically non-significant findings were interpreted as indicating that no statistically detectable differences were observed within the present sample, rather than as evidence of equivalence or the absence of an association in the broader population. The generalizability of the findings is therefore limited, and the results were interpreted within the characteristics and sampling conditions of the study group. Measurement invariance across gender, grade level, and self-reported sensitivity to environmental issues was not examined in the present study. Therefore, subgroup comparisons are interpreted as exploratory comparisons within the study sample rather than as evidence that the measurement structure functions equivalently across these groups.

2.3. Data Collection Instruments

To collect the quantitative data of the research, the Attitude Scale Towards Garden-Based Learning Approach developed by Tasci and Keles [22] was used. The scale was developed to measure the attitudes of prospective teachers towards garden-based learning and consists of three sub-dimensions: "Awareness", "Recycling", and "Research". The measurement instrument contains a total of 20 items. The scale is prepared using a five-point Likert type, and the items are scored between "1 = Strongly disagree" and "5 = Strongly agree". There are no reverse-coded items in the scale. The scale consists of three sub-dimensions: Awareness (items 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 16 and 19), Recycling (items 17, 18 and 20), and Research (items 6, 12, 14 and 15). Subscale scores were obtained by summing the scores of the relevant items, while the total scale score was obtained by summing the scores of all 20 items. Accordingly, scores between 13 and 65 can be obtained from the Awareness subscale, 3–15 from the Recycling subscale, 4–20 from the Research subscale, and 20–100 from the overall scale. Skewness and kurtosis values are presented in Table 1. Table 2 presents the item averages of the subscale and scale scores to facilitate comparison and interpretation, while total scores were used for group comparisons (Tables 3–5). Validity and reliability studies were conducted during the development process of the scale; the Cronbach's Alpha internal consistency coefficient, recalculated within the scope of the research, was found to be 0.907 for the Awareness subscale, 0.602 for the Recycling subscale, and 0.786 for the Research subscale. The Cronbach's alpha coefficient for the overall GBL scale was found to be 0.931. These coefficients indicate strong internal consistency for the Awareness subscale and the overall scale, adequate internal consistency for the Research subscale, and comparatively lower internal consistency for the Recycling subscale [23]. The three-factor structure of the scale was established in the

original scale development study through exploratory factor analysis (EFA), in which the 20 items were grouped under the Awareness, Recycling, and Research dimensions, and the three dimensions accounted for 61.76% of the total variance [22]. No EFA or confirmatory factor analysis (CFA) was conducted in the present study; therefore, the factor structure was not re-examined in the current sample. Accordingly, the subdimensions were interpreted based on the structure established in the original validation study. The total score was used as an overall descriptive indicator of attitudes toward garden-based learning, consistent with the scoring structure reported in the original scale development study. The reliability coefficient for the total scale was interpreted as an indicator of internal consistency only and not as evidence of unidimensionality. Because the present study did not conduct EFA or CFA, the three-factor structure established in the original validation study was retained. Sensitivity to environmental issues was assessed using a single self-report question: "Are you sensitive to environmental problems?" Participants responded by selecting either "Yes" or "No." This variable was used as a dichotomous grouping variable to examine whether prospective social studies teachers' attitudes toward garden-based learning differed according to their self-reported sensitivity to environmental issues. It was not treated as a continuous measure or as an indicator of different levels of sensitivity. To determine prospective teachers' views on Garden-Based Learning, a semi-structured interview form prepared by the researchers was used. The interview form was prepared in line with the purpose and research questions of the study and reviewed by three experts for relevance to the research purpose, clarity, and comprehensibility. Following this review, the final interview sequence proceeded from participants' general views on garden-based learning to perceived benefits, perceived limitations, and suggestions for addressing these limitations. The four interview questions were: (1) "What are your thoughts on the garden-based learning approach?" (2) "What are the benefits of the garden-based learning approach?" (3) "What are the limitations of the garden-based learning approach?" and (4) "What are your views on eliminating the limitations of the garden-based learning approach?" Before the interviews, participants were given a brief explanation of the scope and basic characteristics of the garden-based learning approach to establish a common understanding. The introductory explanation emphasized that GBL refers to learning activities conducted in garden or school-garden environments through direct interaction with nature, observation, and hands-on experiences. No examples, model responses, or instructional materials were provided. Although the questions were open-ended, the explicit focus of the second and fourth questions on benefits and eliminating limitations may have directed participants toward favorable and solution-oriented responses. This potential framing effect was considered when interpreting the qualitative findings.

Table 1. Skewness and kurtosis values for the GBL scale and its subdimensions.

Sub-Dimension/Total	*n*	Skewness	Kurtosis
Awareness	100	−0.21	0.34
Recycling	100	0.18	−0.29
Research	99	−0.11	0.27
GBL Total	99	−0.25	−0.14

Note: GBL = garden-based learning.

Table 2. Descriptive statistics for the overall scale and its subdimensions.

	n	M	SD	Min. Value	Max. Value
Awareness	100	3.76	0.59	2.08	5.00
Recycling	100	3.55	0.68	2.00	5.00
Research	99	3.78	0.64	2.00	5.00
GBL Total	99	3.73	0.56	2.05	5.00

Note: SD = standard deviation; GBL = garden-based learning.

Table 3. Independent-samples *t*-test results by gender.

Dimension	Gender	*n*	M	SD	df	*t*	*p*	Mean Difference [95% CI]	Cohen's d
Awareness	Female	66	48.95	6.35	47.757	0.087	0.931	0.16 [−3.56, 3.88]	0.02
	Male	34	48.79	9.77					
Recycling	Female	66	10.48	1.82	98	−1.134	0.260	−0.49 [−1.34, 0.36]	−0.24
	Male	34	10.97	2.39					
Research	Female	65	15.15	2.05	46.343	0.152	0.880	0.10 [−1.17, 1.36]	0.04
	Male	34	15.06	3.34					
Total GBL	Female	65	74.55	8.96	45.860	−0.097	0.923	−0.27 [−5.87, 5.33]	−0.02
	Male	34	74.82	14.88					

Note: SD = standard deviation; df = degrees of freedom; GBL = garden-based learning.

Table 4. One-way analysis of variance results by grade level.

Dimension	Source	SS	df	MS	F	*p*	Significant Difference	η^2
Awareness	Between Groups	56.595	3	18.865	0.317	0.813	–	0.010
	Within Groups	5714.405	96	59.525	–		–	
	Total	5771.000	99		–		–	
Recycling	Between Groups	3.949	3	1.316	0.312	0.817	–	0.010
	Within Groups	404.801	96	4.217	–		–	
	Total	408.750	99		–		–	
Research	Between Groups	8.408	3	2.803	0.424	0.736	–	0.013
	Within Groups	628.138	95	6.612	–		–	
	Total	636.545	98		–		–	
Total GBL	Between Groups	137.452	3	45.817	0.353	0.787	–	0.011
	Within Groups	12,315.174	95	129.633	–		–	
	Total	12,452.626	98		–		–	

Note: df = degrees of freedom; GBL = garden-based learning. Conventional one-way ANOVAs were used for all four outcomes because Levene's tests indicated homogeneity of variances. No statistically significant grade-level differences were observed; therefore, no post hoc comparisons were conducted.

The interviews were conducted individually by the researchers, who are faculty members in the Social Studies Teacher Education Program in which the participants were enrolled. The interviews were conducted in a private office, with each participant interviewed alone. Participants were informed that participation was entirely voluntary, that their decision to participate or not participate would have no effect on their academic relationship or evaluation, and that they had the right to decline participation or discontinue their participation at any time without any consequence. They were also informed that there were no right or wrong answers, that no particular or favorable response was expected, and that they could freely express positive, negative, or critical views. Written responses

were recorded word-for-word in Turkish by the researchers during the interviews and subsequently reviewed and confirmed by the respective participants; no audio recordings or separate field notes were used. Participants were assigned identification codes (T1–T24) at the beginning of the qualitative data process, and these codes were used in the analysis and reporting to protect participants' identities. The key linking participant identities to the T1–T24 identification codes was held by Mehmet Oran. Access to the original written responses and identifiable participant information was restricted to Mehmet Oran and Mehmet Tamer Kaya. The qualitative data and related participant information will be stored electronically for two years. The interviews lasted approximately 15 min.

Table 5. Independent-samples *t*-test results by sensitivity to environmental issues.

Dimension	Sensitivity to Environmental Issues	*n*	M	SD	df	*t*	*p*	Mean Difference [95% CI]	Cohen's d
Awareness	Yes	80	48.53	8.08	98	−0.982	0.328	−1.88 [−5.66, 1.91]	−0.25
	No	20	50.40	5.44					
Recycling	Yes	80	10.60	2.10	98	−0.490	0.625	−0.25 [−1.26, 0.76]	−0.12
	No	20	10.85	1.79					
Research	Yes	79	15.01	2.71	97	−0.841	0.402	−0.54 [−1.81, 0.73]	−0.21
	No	20	15.55	1.79					
Total GBL	Yes	79	74.10	12.00	97	−0.956	0.341	−2.70 [−8.30, 2.90]	−0.24
	No	20	76.80	7.59					

Note: SD = standard deviation; df = degrees of freedom; GBL = garden-based learning. Pooled-variance independent-samples *t*-tests were used because the homogeneity-of-variance assumption was satisfied for all four outcomes according to Levene's tests.

2.4. Data Analysis

The quantitative data obtained in the study were analyzed using IBM SPSS Statistics version 18.0. Prior to the statistical analyses, the dataset was screened for missing values. One participant had missing data on an item belonging to the Research subdimension. Consequently, a Research subscale score and a Total GBL score could not be calculated for this participant. No imputation procedure was applied. Analyses involving the Research subdimension and Total GBL score were therefore conducted using the available complete cases (n = 99), whereas analyses involving the Awareness and Recycling subdimensions included the full sample (n = 100). The sample sizes reported in the descriptive and inferential analyses were revised accordingly to ensure consistency across the tables.

Before conducting the inferential analyses, the assumptions underlying the independent-samples *t*-tests and one-way ANOVAs were examined separately for each dependent variable and grouping variable. Skewness and kurtosis values were examined as descriptive indicators of distributional shape, with values within ±1 used as a conservative reference for approximate normality [24,25]. In addition, group distributions and model residuals were inspected using Q–Q plots, and potential outlying and influential observations were examined using standardized residuals and Cook's distance. The independence assumption was addressed through the study design, as each participant contributed one set of observations and participants' responses were collected independently.

For comparisons by gender, homogeneity of variances was assessed using Levene's test. The assumption of equal variances was satisfied for the Recycling subdimension (F = 2.561, p = 0.113), but was violated for Awareness (F = 9.288, p = 0.003), Research (F = 17.453, p < 0.001), and Total GBL (F = 11.983, p = 0.001). Accordingly, the conventional independent-samples *t*-test was reported for Recycling, whereas Welch–Satterthwaite adjusted *t*-test results were used for Awareness, Research, and Total GBL. This decision rule

was applied consistently across the dependent variables based on the results of Levene's test rather than on the statistical significance of the *t*-test itself.

For comparisons across grade levels, Levene's tests indicated that the homogeneity-of-variance assumption was satisfied for Awareness, $F(3, 96) = 1.365$, $p = 0.258$; Recycling, $F(3, 96) = 0.913$, $p = 0.438$; Research, $F(3, 95) = 1.216$, $p = 0.308$; and Total GBL, $F(3, 95) = 1.462$, $p = 0.230$. Therefore, conventional one-way ANOVAs were retained for all four outcomes. For comparisons according to sensitivity to environmental issues, Levene's tests indicated that the homogeneity-of-variance assumption was satisfied for Awareness, $F(1, 98) = 2.307$, $p = 0.132$; Recycling, $F(1, 98) = 1.310$, $p = 0.255$; Research, $F(1, 97) = 3.360$, $p = 0.070$; and Total GBL, $F(1, 97) = 3.024$, $p = 0.085$. Accordingly, pooled-variance independent-samples *t*-tests were used for all four environmental sensitivity comparisons. The residual Q–Q plots showed generally acceptable linear patterns, with some deviations in the tails. Shapiro–Wilk tests of model residuals were non-significant for Awareness ($W = 0.980$, $p = 0.138$) and Total GBL ($W = 0.977$, $p = 0.073$), whereas departures from normality were detected for Recycling ($W = 0.965$, $p = 0.009$) and Research ($W = 0.959$, $p = 0.003$). These deviations were considered together with the Q–Q plots, the homogeneity-of-variance results, and the group sizes rather than being interpreted in isolation.

Potentially influential observations were further examined using Cook's distance. The $4/N$ criterion was used as a screening threshold, whereas values greater than 1 were considered indicative of substantial influence. Although several observations exceeded the $4/N$ screening threshold, no observation exceeded Cook's $D = 1$. Sensitivity analyses excluding observations that exceeded the $4/N$ screening threshold did not alter the substantive conclusions of the grade-level comparisons. Accordingly, no observations were removed from the final analyses.

In addition to statistical significance testing, effect sizes and 95% confidence intervals were reported to facilitate interpretation of the magnitude and precision of the observed differences. For two-group comparisons, mean differences with 95% confidence intervals and Cohen's *d* were reported as standardized effect-size estimates. For one-way ANOVA analyses, eta squared (η^2) was used to estimate the proportion of variance associated with the grouping variable. Post hoc comparisons were conducted only when the omnibus ANOVA result was statistically significant. For statistically significant post hoc comparisons, mean differences with 95% confidence intervals and Cohen's *d* were reported. Effect-size estimates were interpreted as descriptive measures of the magnitude of the observed associations and not as evidence of causal effects. No multiplicity adjustment was applied to the primary two-group comparisons or omnibus grade-level ANOVAs, as these analyses were treated as separate planned comparisons rather than as confirmatory multiple-testing families. Accordingly, the *p*-values reported in Tables 3–5 are unadjusted *p*-values. The quantitative analyses used a significance level of 0.05.

The mean scores were reported descriptively on the five-point response scale and were not classified using low, medium, or high cut-off points, as no empirically validated cut-off points were established for the present study.

Content analysis was used to analyze the qualitative data obtained through the semi-structured interview form. All written interview notes were reviewed repeatedly by the researchers to ensure familiarity with the qualitative dataset. The qualitative data were collected and coded in Turkish. The unit of analysis was determined as the participants' meaningful statements related to the research questions. All participant responses were included in the qualitative analysis, regardless of whether they expressed positive, negative, qualified, or critical views. The themes were developed from the full set of coded statements. The excerpts presented in the Results section were selected as illustrative examples of the corresponding coded themes and were not used to determine the themes themselves. Thus,

statements that limited, qualified, or challenged the perceived benefits or applicability of garden-based learning were retained in the analysis and reported under the relevant themes. These statements were coded in accordance with the research objective and the content of the participants' responses, codes with similar meanings were grouped together to form categories, and themes were determined by examining the relationships between the categories. In the process of creating themes and codes, similar statements were evaluated under the same code, while statements with different meanings were coded separately. The obtained themes and codes were reviewed by the researchers to check the consistency between the codes and the correspondence of the themes with the data. In the final stage, the number of participants under each code was determined, and frequencies were calculated and presented in the findings. When a participant expressed multiple conceptually related aspects within the same response, these aspects were retained within the same thematic coding unit; however, each participant was counted only once in the reported frequency for that theme or code. Since a participant may express views under more than one theme or code, the sum of the frequencies is not expected to be equal to the number of participants. Two coders independently coded the qualitative data. An initial agreement rate of 97% was calculated before discussion using the formula Consensus/(Consensus + Disagreement) × 100 [26]. The coders then discussed the discrepant codes and reached consensus. The final consensus was treated as a resolution procedure and was not reported as an independent reliability estimate. Furthermore, the abbreviation "T" (prospective teacher participant) was used when presenting the views of the prospective social studies teachers participating in the research. Although Questions 5 and 6 addressed related aspects of participants' views, they were analyzed according to different analytical purposes. Question 5 focused on participants' general evaluations and perceptions of garden-based learning, whereas Question 6 specifically focused on the benefits that participants attributed to the approach. During coding, statements expressing an overall evaluation or characterization of GBL were coded under Question 5, while statements explicitly identifying a perceived contribution, advantage, or beneficial outcome were coded under Question 6. When conceptually similar ideas appeared in responses to both questions, they were retained within the analysis of the question in which they were expressed but were not treated as independent evidence of a greater prevalence of that idea across the qualitative dataset. Frequencies reported in Tables 6 and 7 therefore represent question-specific coding frequencies and should not be aggregated across the two tables.

Table 6. Prospective teachers' views of the garden-based learning approach.

Theme	Code	Participant	f
Learning Process	Learning by doing/living, direct learning, permanent learning, memorable, reinforcing theoretical knowledge with practice, provides interactive learning	T2, T3, T5, T6, T7, T9, T10, T13, T15, T19, T20, T21, T23	13
Holistic Development	It provides character development, environmental awareness, cognitive and emotional development, enables them to take responsibility, sustainability, society and nature relations, cooperation and problem solving	T5, T8, T9, T12, T13, T15, T16, T17, T20, T21, T22, T24	12
Motivation and Interest	Making the lesson enjoyable, making the lesson fun, loving the school, encourages learning	T4, T6, T11, T13, T16, T18, T23	7
Emotional and Psychological Contributions	Stress reduction, relief, feeling free, energy release	T1, T2, T3, T14, T17	5

Note: f = frequency; T = prospective teacher participant.

Table 7. Prospective teachers' views of the benefits of garden-based learning.

Theme	Code	Participant	f
Environmental Sensitivity	It raises awareness of nature, responsibility towards nature, establishing a connection with nature, environmental awareness, and sensitivity towards nature	T1, T2, T3, T6, T8, T9, T10, T13, T15, T17, T19, T20, T21, T22, T23	15
Holistic Development	It supports physical development, ensures emotional and mental development, provides social development, improves motor skills, and instills awareness of healthy eating	T2, T5, T6, T9, T12, T13, T15, T16, T19, T21, T22, T23, T24	13
Learning Process	It prevents memorization, provides direct participation, ensures permanent learning, provides effective and permanent learning, and provides learning by doing and experiencing	T1, T2, T3, T5, T6, T8, T9, T13, T15, T18, T21	11
Motivation and Interest	It motivates the lesson, increases interest in the lesson, and learning becomes less boring	T3, T4, T5, T9, T11, T14, T15, T19	8
Social Development and Interaction	Increases social development, increases socialization, improves social skills, increases cooperation and solidarity	T1, T3, T4, T5, T7, T8	6

Note: f = frequency; T = prospective teacher participant.

3. Results

3.1. Quantitative Results

Table 2 presents the descriptive statistics for the attitude scale towards the garden-based learning approach. The overall mean score was 3.73 on the five-point response scale. Among the subdimensions, the mean scores were 3.76 for Awareness, 3.55 for Recycling, and 3.78 for Research. These values are reported descriptively and are not interpreted using low, medium, or high cut-off points, as no empirically validated cut-off points were established for the present study.

The analysis revealed no statistically significant difference between the scores of female and male prospective teachers in terms of the sub-dimensions of Awareness ($t(47.757) = 0.087$, $p = 0.931$), Recycling ($t(98) = -1.134$, $p = 0.260$), Research ($t(46.343) = 0.152$, $p = 0.880$) and the overall scale ($t(45.860) = -0.097$, $p = 0.923$). This result indicates that no significant difference was found between gender groups in terms of attitudes towards garden-based learning in the current sample. However, the absence of a significant difference should not be interpreted as meaning that the groups are completely equivalent or that gender has no effect whatsoever.

A one-way ANOVA was conducted to examine whether prospective teachers' attitudes toward garden-based learning differed significantly according to grade level. The results indicated that there were no statistically significant differences between grade levels in the "Awareness" sub-dimension, $F(3, 96) = 0.317$, $p = 0.813$; the "Recycling" sub-dimension, $F(3, 96) = 0.312$, $p = 0.817$; the "Research" sub-dimension, $F(3, 95) = 0.424$, $p = 0.736$; or the overall GBL scale, $F(3, 95) = 0.353$, $p = 0.787$. Although some descriptive differences may be observed among the class-level means, these differences did not reach statistical significance. Therefore, the findings do not provide sufficient statistical evidence to conclude that prospective teachers' attitudes toward garden-based learning differ according to grade level in the present sample. Given the cross-sectional nature of the study, any observed descriptive differences between grade levels should not be interpreted as evidence of change resulting from progression through the teacher education process. Such differences, if observed, may be associated with various factors, including previous educational

experiences or individual characteristics; however, these possible explanations were not directly examined in the present study.

Whether there was a significant difference between the groups according to sensitivity to environmental issues in the overall scale and its subdimensions was examined using independent-samples *t*-tests. The results indicated no statistically significant differences between prospective teachers with and without sensitivity to environmental issues in the Awareness subdimension, $t(98) = -0.982$, $p = 0.328$; Recycling subdimension, $t(98) = -0.490$, $p = 0.625$; Research subdimension, $t(97) = -0.841$, $p = 0.402$; or Total GBL score, $t(97) = -0.956$, $p = 0.341$. Thus, within the present sample, self-reported sensitivity to environmental issues was not associated with statistically significant differences in prospective teachers' GBL scores. Given the cross-sectional and unadjusted nature of these comparisons, these findings should not be interpreted as evidence regarding the causal influence of sensitivity to environmental issues on attitudes toward garden-based learning.

3.2. Qualitative Results

The qualitative themes presented below were developed from the full set of participant responses, including positive, negative, qualified, and critical statements. The excerpts are illustrative examples of the coded data and do not represent the entire range of statements within each theme.

3.2.1. Meanings Associated with Garden-Based Learning

The responses of prospective teachers participating in the study to the question, "What are your thoughts on the garden-based learning approach?" were grouped into four different themes. These themes are as follows:

As seen in Table 6, the views of prospective social studies teachers regarding the garden-based learning approach are grouped under four themes: views on the Learning Process, views on Holistic Development, views on Motivation and Interest, and views on Emotional and Psychological Contributions.

The prospective teachers who participated in the study expressed their views about the learning process as follows: learning by doing/experiencing, direct learning, permanent learning, being memorable, reinforcing theoretical knowledge with practice, providing interactive learning (13). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "It allows children to learn by doing, experiencing, and experimenting, and they gain many experiences they might not have in the institution." (T2)

> "Learning by doing directly, rather than theoretical knowledge, is both memorable and easy to remember." (T3)

> "I place great importance on garden-based learning. Students learning by touching the soil and observing living things is both permanent and meaningful." (T20)

The prospective teachers who participated in the study expressed their views on holistic development as follows: It provides character development, environmental awareness, cognitive and affective development, responsibility, sustainability, society and nature relations, cooperation and problem-solving ability (12). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> ". . . I also think it supports skills such as sustainability, environmental awareness, and responsibility." (T6)

> "I think the garden-based approach is very valuable in terms of encouraging a connection with nature and raising environmental awareness in individuals." (T8)

> "As a prospective social studies teacher, I believe this method contributes significantly to both the cognitive and affective development of students." (T21)

> "I think garden-based learning contributes not only to academic development but also to character development." (T22)

Prospective teachers participating in the study expressed their views on motivation and interest as follows: "Making the lesson enjoyable, making the lesson fun, loving school, and encouraging learning" (7). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Working in the garden will reduce their stress. In other words, they will have fun while learning." (T13)

> "Education being intertwined with nature will increase students' enthusiasm and desire to learn. This approach will ensure that students come to school with pleasure. This will make lessons enjoyable." (T18)

Prospective teachers participating in the study expressed their views on the emotional and psychological benefits as stress reduction, relief, feeling free, and releasing energy (5). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Thanks to this approach, students can feel more free. Being outside instead of inside the classroom can be refreshing." (T1)

> "Students studying in the garden will make them feel more comfortable and at peace." (T14)

As can be seen from the responses above, the prospective teachers' views suggest that the garden-based learning approach may facilitate learning through active participation, contribute to students' multifaceted development, make lessons more engaging, and support students' emotional needs. These findings suggest that garden-based learning may support not only academic learning but also students' holistic development.

3.2.2. Benefits of Garden-Based Learning

The responses of prospective teachers participating in the study to the question, "What are the benefits of the garden-based learning approach?" were collected under five different codes. These codes are as follows:

As shown in Table 7, the views of prospective social studies teachers regarding the benefits of the garden-based learning approach are grouped under 5 themes: environmental awareness, holistic development, learning process, motivation and interest, social development, and interaction.

Prospective teachers participating in the study expressed their views on environmental awareness as follows: "It raises awareness of nature, responsibility towards nature, connecting with nature, fosters environmental awareness, and fosters sensitivity to nature" (15). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Garden experiences provide opportunities for real-life experiences and foster an awareness of nature." (T10)

> "It helps children connect with nature. It encourages children to take responsibility for things like growing and caring for plants." (T17)

> "Garden-based learning not only teaches children about nature but also raises awareness of issues like landscaping and spatial design. Individuals who grow up with this type of education become more sensitive to nature." (T20)

Prospective teachers participating in the study expressed their views on holistic development as follows: "It supports physical development, provides emotional and mental development, provides social development, improves motor skills, and provides awareness of healthy eating" (13). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "It provides significant benefits not only in terms of physical but also emotional and mental development." (T5)

> "This approach contributes greatly to children's physical, emotional, and social development. Outdoor activities improve children's motor skills." (T24)

Prospective teachers participating in the study expressed their views on the learning process as follows: "It prevents memorization, provides direct participation, ensures permanent learning, provides effective and lasting learning, and provides learning by doing and experiencing" (11). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "It has many benefits. First of all, it moves lessons away from memorization and makes them more experienceable. Because students directly participate, learning becomes more permanent." (T3)

> "This method allows students to learn by doing and experiencing by interacting with nature. It makes students' learning processes more effective and lasting." (T18)

The prospective teachers who participated in the study expressed their views on motivation and interest as follows: (8) It motivates the lesson, increases interest in the lesson, and prevents learning from being boring. Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "When I was in middle school, our teacher would take us outside every week and have us play various games. We were more motivated to learn." (T4)

> "It encourages learning and can attract students' attention because it allows them to apply the information learned in a different environment. This way, students are more motivated to learn." (T11)

The prospective teachers who participated in the study expressed their views on social development and interaction as follows: (6) It increases social development, socialization, develops social skills, and increases cooperation and solidarity. Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Socialization increases thanks to group work." (T1)

> "It provides social interaction. It develops students' social skills. It increases students' interaction with the environment." (T7)

When the above participant views are evaluated, they appear to suggest that the garden-based learning approach may contribute to the development of environmental awareness and sustainable living values, may offer various opportunities for students' cognitive, affective, and social development, and may make the learning process more enjoyable and motivating.

3.2.3. Limitations of Garden-Based Learning

The responses of prospective teachers participating in the study to the question, "What are the limitations of the garden-based learning approach?" were grouped into seven different themes. These themes are as follows:

As seen in Table 8, the views of prospective social studies teachers regarding the limitations of the garden-based learning approach are gathered under 7 themes: infrastructure and equipment deficiencies, environmental factors, teacher competence and preparation, financial resource problems, student-related factors, safety and health concerns, and time and program limitations.

Table 8. Prospective teachers' views of the limitations of garden-based learning.

Theme	Code	Participant	f
Infrastructure and Hardware Deficiencies	The physical conditions of the school may not be sufficient; there may not be enough space	T1, T2, T3, T4, T5, T6, T8, T9, T10, T12, T15, T16, T19, T21, T22, T23	16
Environmental Factors	Climate and seasonal conditions, winter conditions, unsuitable open air, adverse effects of wind, sun and rain	T3, T4, T5, T6, T7, T8, T9, T13, T14, T15, T16, T20, T21, T22, T23	15
Teacher Competence and Preparation	Teachers are not prepared, do not have enough knowledge, do not have enough experience, do not have enough equipment	T1, T5, T6, T9, T10, T13, T15, T17, T19, T21	10
Financial Resource Problems	Insufficient budget, costly nature of such activities, cost problem	T3, T5, T6, T7, T12, T19, T21, T23	8
Student-Related Factors	Student disinterest, unfamiliarity with activities, inability to adapt	T1, T2, T5, T7, T13, T14	6
Safety and Health Concerns	Security issues, chronic illnesses, asthma and allergy problems in children, insect bites	T2, T11, T18, T24	4
Time and Schedule Restrictions	Time constraints, curriculum density	T2, T19, T23	3

Note: f = frequency; T = prospective teacher participant.

Prospective teachers participating in the study expressed their views on infrastructure and equipment deficiencies as follows: "The physical conditions of the school may not be sufficient, and there is not enough space" (16). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Not every school has a garden, and those that do may not have enough space or suitable ground." (T6)

> "Not every school has sufficient garden space or physical conditions." (T21)

Prospective teachers participating in the study expressed their views on environmental factors as follows: climatic and seasonal conditions, winter conditions, unsuitable outdoor conditions, and the negative effects of wind, sun, and rain (15). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Climatic and seasonal conditions also create limitations. Harsh winter conditions, in particular, can lead to a reduction in practice areas." (T16)

> "Garden-based learning has aspects that support creativity, but outdoor conditions may not always be suitable. Factors such as wind, sun, and rain can negatively affect both materials and students' attention." (T20)

Prospective teachers participating in the study expressed their views regarding teacher competence and preparation as follows: teachers are not prepared, do not have sufficient

knowledge, do not have sufficient experience, and do not have sufficient equipment (10). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Teachers may not have sufficient knowledge and experience to implement this approach." (T9)

> "Above all, teachers need to have sufficient knowledge and equipment to implement this approach. Sometimes this can be a problem." (T15)

Prospective teachers participating in the study expressed their views on financial resource issues as follows: insufficient budget, the costly nature of such activities, and cost problems (8). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "The lack of sufficient budget allocation for such activities in schools can also be an obstacle. Creating the necessary materials and spaces for nature-related activities, especially in public schools, can be quite costly." (T5)

> "Providing the necessary equipment and support can be financially costly." (T12)

The prospective teachers who participated in the study expressed their views regarding student-related factors as follows: student disinterest, unfamiliarity with activities, and inability to adapt (6). An example of a direct quote from the prospective teachers regarding their views regarding as follows:

> "Not all students may be equally interested in garden-based learning." (T13)

Prospective teachers participating in the study expressed their views on safety and health concerns as follows: security issues, chronic illnesses, asthma and allergy issues in children, and insect bites (4). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Providing security can be difficult." (T18)

> "Being close to nature is nice, but it can pose some risks for children with allergies and asthma. Things like pollen and insect bites can cause problems for sensitive bodies." (T24)

Participating prospective teachers expressed their views on time and schedule constraints as follows: time constraints and curriculum density (3). An example of a direct quote from the prospective teachers regarding their views regarding as follows:

> "There may not be enough time allocated due to the curriculum density." (T19)

According to prospective teachers, while the garden-based learning approach may offer various pedagogical opportunities, it may also present some limitations during its implementation. These limitations, as noted by the participants, appear to encompass structural (physical and material) conditions as well as personal and environmental dimensions.

3.2.4. Strategies for Addressing the Limitations

The responses of prospective teachers participating in the study to the question, "What are your views on eliminating the limitations of the garden-based learning approach?" were collected under five different themes. These themes are as follows:

As seen in Table 9, the views of prospective social studies teachers regarding addressing the limitations of the garden-based learning approach were primarily grouped into four themes: physical and infrastructure improvements, education and awareness studies, providing financial resources, and increasing security measures. In addition, technology integration emerged as a less frequently mentioned suggestion (f = 1).

Table 9. Prospective teachers' views on addressing the limitations of garden-based learning.

Theme	Code	Participant	f
Physical and Infrastructure Improvements	Existing areas can be used efficiently, arrangements can be made in schools within the available possibilities, and school gardens can be designed in an attractive way	T1, T3, T4, T5, T6, T7, T9, T13, T15, T16, T17, T19, T21, T22, T23	15
Education and Awareness Studies	Training can be given to teachers/students	T1, T2, T3, T6, T7, T10, T11, T15, T17, T19, T20, T21, T23	13
Providing Financial Resources	Budget can be allocated, sponsors can be found, cooperation with municipalities can be made	T2, T6, T7, T8, T12, T20, T21, T24	8
Increasing Security Measures	Security can be increased, ground arrangements can be made, safe environments can be provided	T2, T11, T14, T18, T23	5
Additional suggestion: Technology Integration	Technology can be used more; digital content can be prepared	T3	1

Note: f = frequency; T = prospective teacher participant.

Prospective teachers participating in the study expressed their views on physical and infrastructural improvements as follows: existing spaces can be used efficiently, arrangements can be made in schools within the available resources, and schoolyards can be designed in an attractive way (15). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "Not every school needs a large garden. Existing spaces can be used more efficiently. For example, the small size of the schoolyard can be compensated for by organizing nature-related activities indoors." (T5)

> "The schoolyard can be designed in a way that students enjoy to attract their attention." (T13)

Prospective teachers participating in the study expressed their views on education and awareness-raising activities as follows: (13). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "First of all, teachers and students should be provided with training on the garden-based approach." (T2)

> "Teachers can be provided with training on this topic." (T23)

The prospective teachers who participated in the research expressed their views on the provision of financial resources as follows: a budget can be allocated, sponsors can be found, and cooperation can be made with municipalities (8). Some examples of direct quotes regarding the views expressed by the prospective teachers as follows:

> "To eliminate these limitations, we must first identify them. After determining these, sponsors can be found for equipment support, for example." (T12)

> "Financial support should be provided to schools, green spaces should be encouraged, and collaboration with municipalities should be established." (T24)

The prospective teachers who participated in the research expressed their views about increasing security measures as follows: security can be increased, ground arrangements can be made, safe environments can be provided (5). An example of a direct quote from the prospective teachers regarding their views regarding as follows:

> "Security measures should be taken. Safe areas should be created in the garden, the ground should be arranged, and a safe environment should be provided for students." (T11)

Here is a direct quote from a participant regarding a differentiated recommendation on the use of technology:

> "Digital content could also be prepared to support lessons. This way, the shortcomings would be addressed." (T3)

When considering the views of prospective teachers, it appears that they believe the limitations of the garden-based learning approach may be minimized. To this end, they appear to have proposed multi-faceted solutions such as structural changes (garden arrangements), investment in human resources (teacher/student training), allocation of financial resources, strengthening of security infrastructure, and, as a differentiated suggestion, providing technological support.

Table 10 summarizes the integration of the quantitative and qualitative findings at the aggregate findings level. The quantitative findings provide descriptive information on prospective teachers' attitudes toward garden-based learning, with an overall mean score of 3.73 on the five-point response scale and a mean score of 3.76 for the Awareness subdimension. The qualitative findings add contextual detail by illustrating how participants described garden-based learning in relation to learning, holistic development, motivation, and environmental and nature-related awareness. These qualitative findings are considered complementary to the quantitative results, but they are not treated as direct measures or validations of the corresponding quantitative dimensions. In addition, the qualitative findings identified implementation limitations, including infrastructure, environmental conditions, teacher preparation, financial resources, safety, and time, as well as possible solutions such as infrastructure improvements, training, financial support, safety measures, and technology integration. These aspects were not directly assessed by the quantitative instrument and therefore represent additional information provided by the qualitative component. Because the qualitative data were not retained in a participant-level linked dataset, the integration does not involve within-case comparisons or associations between individual quantitative scores and qualitative responses. Accordingly, the integrated findings provide two related and complementary perspectives on prospective teachers' attitudes and views toward garden-based learning while remaining within the measurement and data-management boundaries of the study.

Table 10. Integration of quantitative and qualitative findings.

Quantitative Findings	Qualitative Findings	Relationship	Integrated Interpretation
Overall attitude toward GBL had a mean score of 3.73 on the five-point response scale.	Participants described GBL in terms of learning, holistic development, motivation, and emotional/psychological benefits.	Complementarity	The quantitative finding indicates a generally favorable orientation toward GBL, while the qualitative findings provide contextual detail about the aspects of GBL that participants associated with this favorable orientation.
Awareness subdimension had a mean score of 3.76.	Nature awareness and environmental consciousness were frequently emphasized (f = 15).	Complementarity	The qualitative findings provide more specific descriptions of environmental and nature-related perceptions that are broadly related to the awareness dimension but are not treated as equivalent measures.

Table 10. *Cont.*

Quantitative Findings	Qualitative Findings	Relationship	Integrated Interpretation
Recycling subdimension had a mean score of 3.55.	Participants identified infrastructure, environmental conditions, teacher preparation, financial resources, safety, and time as implementation limitations.	Complementarity	The qualitative findings extend the quantitative results by identifying contextual conditions that were not directly assessed by the attitude scale.
Research subdimension had a mean score of 3.78.	Participants suggested infrastructure improvements, training, financial support, safety measures, and technology integration.	Complementarity	The qualitative findings provide additional practical information about how participants believed implementation barriers could be addressed.

4. Discussion

This study investigated whether prospective social studies teachers' attitudes towards garden-based learning (GBL) differed according to gender, grade level, and sensitivity to environmental issues.

In the present study, the overall mean score for attitudes toward garden-based learning was 3.73 on a five-point response scale. The Awareness and Research subdimensions had mean scores of 3.76 and 3.78, respectively, whereas the Recycling subdimension had a mean score of 3.55. These values should be interpreted descriptively rather than as evidence of empirically established low, moderate, or high levels of the construct. The overall pattern is broadly comparable to the findings reported by Tasci and Keles [22], who also examined prospective teachers' attitudes toward garden-based learning. This comparison should nevertheless be understood as descriptive rather than as evidence that the same quantitative level or construct threshold was established across the two studies. The similarity between these findings may suggest that prospective teachers tend to view GBL positively, potentially because of its student-centered and active participation-based characteristics. This interpretation is also consistent with Blair's [14] emphasis on the student-centered, active participation-based, and sustainable learning aspects of garden-based learning. Thus, incorporating environmental education, sustainability, and outdoor learning experiences into teacher training programs may provide prospective teachers with opportunities to become more familiar with GBL and its potential educational uses. The qualitative findings provide further insight into the reasons underlying this generally positive orientation. Prospective teachers' views suggest that GBL may encourage active participation, provide opportunities for students' multifaceted development, make lessons more engaging and motivating, and facilitate social interaction. Rather than presenting these perceptions as direct effects of GBL on students, these findings indicate how prospective teachers conceptualize the potential contributions of this approach to students' academic, social, and affective development. This distinction is important because students' academic achievement, behaviors, or developmental outcomes were not directly measured in the present study. The environmental and sustainability-related dimension of these perceptions is particularly noteworthy. Participants suggested that GBL may contribute to self-reported sensitivity to environmental issues and sustainable living values while also supporting cognitive, affective, and social development, enjoyment, motivation, social interaction, and cooperation. These findings suggest that prospective teachers may perceive GBL not merely as a teaching method, but as a broader learning approach through which environmental and sustainability issues can be integrated into educational experiences. This interpretation is supported by research conducted in Spain, where 58.8% of prospective teachers considered educational gardens suitable settings for climate change and sustainability education [27]. The consistency between this finding and the present qualitative results strengthens the

possibility that prospective teachers associate garden-based learning with self-reported sensitivity to environmental issues and sustainability. Other studies provide further support for the educational potential attributed to garden-based learning, although they differ from the present study in terms of participants and research designs. Bartosh et al. [28], based on interviews and observations, found that garden activities were perceived as meaningful and educationally powerful. McArthur et al. [29] similarly reported positive findings concerning students' learning, academic performance, attitudes towards the environment, and environmental awareness. Somuncu Demir [30] also examined a sustainable agriculture-based garden learning strategy and reported findings related to primary school students' academic achievement and their environmental awareness, attitudes, and behaviors. Taken together, these studies and the present findings point to a potentially broad educational role for garden-based learning across academic, environmental, and socio-affective domains. However, the evidence should be interpreted in light of the differences between the studies. Whereas previous research such as McArthur et al. [29] and Somuncu Demir [30] examined outcomes among students, the present study primarily examined prospective teachers' attitudes and perceptions. Therefore, the current findings suggest the perceived potential of GBL rather than demonstrating direct effects on student outcomes.

When the findings regarding the gender variable are examined, no statistically significant difference was found between female and male prospective teachers' attitudes towards garden-based learning. Similarly, no statistically significant differences were found in the Awareness, Recycling, and Research sub-dimensions or in the total GBL scores. No statistically significant gender difference was detected in the present sample. This finding should not be interpreted as evidence of equivalence between the groups or as evidence that gender has no influence on attitudes toward GBL. This finding is consistent with several studies examining gender differences in out-of-school and nature-based learning contexts. Isgoren [31] found that classroom teachers' attitudes towards out-of-school learning did not differ significantly by gender, while Demir and Cetin [32] reported similar results regarding teachers' attitudes towards out-of-school activities. Usta [33] and Koca [34] likewise found no significant gender differences in different dimensions of out-of-school learning environments. The consistency of these findings across different samples may suggest that attitudes towards learning outside the classroom are not necessarily differentiated by gender and may instead be shaped by contextual and experiential factors. At the same time, the present finding differs from several studies reporting gender-related differences. Ernst and Tornabene [35] found that female prospective teachers showed greater interest and commitment to nature-based learning environments, while Koc and Kuvac [36] reported more positive environmental attitudes among female pre-service science teachers than among their male counterparts. Similarly, Ugurlu [37] found gender differences in classroom teachers' concerns regarding out-of-school learning environments, with higher scores among male teachers. Caner [38] reported more positive attitudes among female teachers towards sustainable environmental education in out-of-school learning environments, and Kaya [39] found that female teachers planned out-of-school activities more frequently than male teachers. Gokce et al. [40] reported more positive environmental attitudes among female students, whereas Gul Emre [41] found lower carbon footprint levels among female prospective social studies teachers. In addition, female participants were reported to have higher scores on the garden-based learning attitude scale developed by Tasci and Keles [22]. Dulger and Gumus [42] suggested that women's perceptions of environmental risk and their emotional connection with nature may be related to their attitudes towards out-of-school learning. Taken together, the contrasting findings suggest that the role of gender may depend on the specific construct being measured, the characteristics of the participants, and the educational context. The present study contributes to this mixed evi-

dence by showing that gender was not associated with statistically significant differences in prospective teachers' attitudes towards GBL or its Awareness, Recycling, and Research dimensions. However, this result should not be interpreted as evidence that gender has no influence on attitudes towards GBL. Rather, it indicates that no statistically significant gender difference was detected within the present sample.

No statistically significant grade-level difference was detected in the present sample. These results should not be interpreted as evidence of equivalence across grade levels or as evidence of developmental change associated with progression through the teacher education program. The absence of a statistically significant difference may indicate that grade level alone does not necessarily differentiate prospective teachers' attitudes towards GBL. However, due to the cross-sectional nature of the research, this finding cannot be interpreted as evidence that attitudes remain unchanged throughout the teacher training process. Since the participants in the first and fourth years were not the same individuals, the absence of a significant difference should not be interpreted as evidence of stability or development over time. The findings can be considered in relation to previous research emphasizing the role of experience in shaping prospective teachers' perceptions of nature-based and outdoor learning. Dyment et al. [43] drew attention to the relationship between prospective teachers' professional experiences and their perceptions of nature-based learning environments. Similarly, Maynard et al. [44] found that prospective teachers' experiences with outdoor practices may be important for connecting theoretical knowledge with practice. These findings highlight the potential relevance of experience and opportunities to engage with outdoor and nature-based learning; however, they do not necessarily imply that such experiences will result in statistically significant differences between grade levels. Williams and Dixon [45] further highlight the pedagogical importance of garden-based learning in teacher education. In this context, the lack of a statistically significant grade-level difference in the present study may point to the importance of examining how GBL experiences are incorporated into teacher education programs at different stages, rather than assuming that progression through the program itself leads to more positive attitudes. More comprehensive longitudinal research could help clarify whether and how participation in GBL experiences contributes to changes in prospective teachers' attitudes over the course of teacher education. Thus, the findings of the present study should be interpreted as indicating that prospective teachers' attitudes towards GBL did not differ significantly across grade levels in the present sample, rather than as evidence that their attitudes remain unchanged or develop as a result of progression through the teacher training process.

This study compared the attitudes of prospective teachers with and without self-reported sensitivity to environmental issues towards garden-based learning (GBL) and found no statistically significant differences in the Awareness, Recycling, and Research subdimensions or in the total GBL scores. This finding suggests that self-reported sensitivity to environmental issues did not statistically differentiate prospective teachers' attitudes toward GBL in the present sample. Rather, the relationship between self-reported sensitivity to environmental issues and GBL attitudes may depend on the specific context and characteristics of the learning environment. This interpretation is consistent with Blair [14], who noted that the effects of school garden practices on environmental attitudes have not been consistently demonstrated in quantitative research. Similarly, Aguilar et al. [46] found no significant difference in environmental attitudes between students participating in a school garden program and a control group. Pérez-López et al. [47] also found that although scores increased across all four examined measures following a learning garden experience, statistically significant changes were observed for only two measures, while the change in participants' conceptions of nature was not statistically significant. Taken together, these findings provide support for the possibility that exposure to or attitudes to-

wards garden-based learning do not necessarily produce statistically significant differences in environmental-related outcomes across all samples and measures. At the same time, the present finding differs from the results reported by Ozturk [48], Sengupta et al. [49], Gurer and Mermer [50], and Gul Emre [41], which identified relationships between environmental awareness and environmental or nature-oriented variables. However, these studies examined variables different from attitudes towards GBL. Therefore, the differences between these findings and the present results may partly reflect differences in the constructs examined, samples, and research contexts. In other words, although environmental awareness may be associated with environmental and nature-oriented attitudes more generally, this association does not necessarily imply that prospective teachers with different levels of environmental awareness will also differ in their attitudes towards GBL. GBL attitudes may additionally be shaped by experiences with gardens as learning environments and perceptions of their educational use. Overall, the findings suggest that the relationship between sensitivity to environmental issues and GBL attitudes may not emerge consistently across different research contexts. However, the absence of a statistically significant difference should not be interpreted as evidence that sensitivity to environmental issues is unrelated to GBL attitudes. Given the cross-sectional research design and the grouping of sensitivity to environmental issues, longitudinal and more comprehensive studies are needed to clarify the nature and direction of this relationship.

This study has several limitations. First, the study was conducted with prospective social studies teachers from a single university and used a cross-sectional design; therefore, the findings have limited generalizability and cannot be used to assess changes over time. Second, the quantitative sample was based on accessible participants who voluntarily participated, and no a priori power analysis based on a prespecified minimum effect size was conducted. In addition, the qualitative sample consisted of volunteers who self-selected from the quantitative sample, which may have introduced self-selection bias. Third, information regarding participants' prior garden experience, previous exposure to garden-based learning, and prior environmental training was not systematically collected, so the potential influence of these characteristics could not be examined. Information on class sections and potential clustering by shared instructional contexts was not systematically collected; therefore, the possibility of dependence arising from shared classroom or instructional conditions could not be evaluated. Fourth, the data were largely based on self-reports, and although participants were encouraged to express positive, negative, and critical views freely, social desirability bias cannot be completely excluded. Fifth, the qualitative data were documented in writing rather than audio-recorded. The participants' responses were recorded word-for-word in Turkish by the researchers and subsequently reviewed and confirmed by the respective participants. Selected excerpts were then translated into English by the researchers and checked against the original Turkish statements to preserve their intended meaning. Finally, quantitative and qualitative data were not retained in a participant-level linked dataset, although the 24 qualitative participants were part of the quantitative sample. This data-management decision limited the extent to which individual-level quantitative patterns could be directly compared with qualitative responses. Therefore, the findings should be interpreted as evidence concerning prospective teachers' attitudes and perceptions rather than as evidence of causal effects or demonstrated effects of garden-based learning.

The findings should be interpreted in light of the analytical and design-related limitations of the study. The quantitative group comparisons represent unadjusted bivariate associations. Grade level and sensitivity to environmental issues may be associated with other participant characteristics, such as gender, age, previous environmental experiences, or prior environmental education. Therefore, the observed differences cannot be attributed

uniquely to the grouping variables examined in this study. Furthermore, given the cross-sectional nature of the study, the findings do not establish temporal ordering, change over time, or causal relationships. Future research may address these limitations through longitudinal designs and theoretically prespecified multivariable models that account for potential confounding variables.

5. Conclusions and Recommendations

Conclusions

Prospective social studies teachers reported favorable views toward garden-based learning, while the quantitative findings showed an overall mean score of 3.73 on the five-point attitude scale. No statistically significant differences were found according to gender, grade level, or sensitivity to environmental problems. The qualitative findings show that GBL is perceived as a sustainability-oriented approach that can combine experiential learning, environmental responsibility, motivation, social interaction, and holistic development. Its successful implementation, however, depends on adequate space and resources, teacher preparation, safety planning, and institutional support. These findings suggest that prospective teachers perceive GBL as a potentially valuable approach for incorporating experiential, environmental, and socially oriented learning practices into teacher education.

Based on the quantitative and qualitative findings of the research and the views of prospective teachers, some suggestions have been developed regarding the use of garden-based learning in the context of teacher training and social studies teaching. Accordingly, the inclusion of elective courses or content related to garden-based learning in the social studies curriculum could be considered. Linking nature and environment-themed learning outcomes with garden-based learning activities, developing joint garden-based projects between practice schools and faculties of education, and integrating garden-based learning activities with different disciplines are among the applications that could be considered in the future. Furthermore, opportunities for collaboration with local governments and civil society organizations in the educational use of school gardens, outdoor classrooms, or small-scale agricultural areas could be evaluated. However, since the feasibility, cost, safety conditions, teaching load, and educational outcomes of these suggestions were not directly examined within the scope of this research, it is recommended that these dimensions be evaluated in future research.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. For ethical reasons, we cannot upload all the data we have.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

GBL	Garden-based learning
T	Prospective teacher participant
f	Frequency
Max	Maximum
Min	Minimum
n	Sample size
M	Mean
SD	Standard deviation
df	Degrees of freedom
t	*t*-statistic (*t*-value)
p	Probability value
F	F-statistic

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