

Effectiveness of Forest Pedagogy Activities in Slovakia – the “Lesu Zdar” Project

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Abstract

This paper evaluates the effectiveness of forest pedagogy as an informational forest policy instrument. The object of our study was the forest pedagogy activity – project “LESU ZDAR” targeted at high school students. Combining document analysis and semi-structured interviews, we analysed the perceived effectiveness of the project’s primary goals by all involved actors – students, teachers and forest pedagogues. Forest pedagogy was considered highly effective in enhancing pedagogic activities as a curricular enrichment, raising awareness and encouraging civic engagement among all project participants. However, its influence on career orientation was limited, as the percentage of students considering a forestry-related profession dropped post-project. Individual actors also perceived a lower level of effectiveness in influencing students’ attitudes toward forestry.

Key words: forest pedagogy; effectiveness; informational policy instruments; Slovakia; case study

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1. Introduction

Forests provide a wide range of ecological, economic, and social benefits to society, but public understanding of sustainable forest management remains limited. Along with a growing societal demand for forests, forest ownership structure is changing (Feliciano et al. 2019; Weiss et al. 2019). New types of forest owners are emerging, with no previous connection to the forestry sector (Matilainen et al. 2019). Their behaviour and approach to ownership further influence their decision-making on forest management issues. Engaging citizens – especially youth – in forest-related topics is essential, as their awareness of forests’ role in sustainability can significantly influence future forest policies (Macanović 2017). Exposure to nature through structured programs can lead to more favourable attitudes toward the environment, encouraging pro-environmental behaviours (Ardoin et al. 2022).

New types of policy instruments are needed to reflect on current challenges regarding sustainable forest management. Policy instruments refer to specific techniques and tools used by governing or public authorities to promote desired behaviour and/or achieve a predefined

set of policy objectives (Baulenas & Sotirov 2020; Luo & Zhang 2020; Longato et al. 2024). Informational policy instruments aim to explicitly influence actors’ behaviour and actions via information (Krott 2005), using only persuasive measures to enhance collective actions (Böcher 2012). Their primary aims are to either transfer the knowledge, raise awareness, communicate reasoned arguments, moral suasion (Baulenas & Sotirov 2020; Bhardwaj et al. 2020) and enhancing public engagement (Wang et al. 2024). Informational policy instruments are usually not legally binding and do not require a considerable amount of state intervention (Böcher 2012). Using informational policy instruments is necessary, but they are believed to be insufficient for achieving policy objectives by themselves (Karl & Orwat 1999). For achieving various policy objectives within the frame of forest policy, usually, a combination of policy instruments is used by policymakers (Polyakov & Teeter 2003; Howlett et al. 2005; Šálka et al. 2017). In alignment with policy mixes, informational instruments are commonly used to complement regulatory or economic instruments (Weiss 2000). They can be used to elevate public awareness, stimulate public engagement, improve decision-making

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processes among stakeholders, and positively affect the performance and acceptance of regulatory or economic instruments and innovation processes (Weiss 2000; Šálka et al. 2017; Upton et al. 2019; Baulenas & Sotirov 2020; Kärkkäinen et al. 2020; Fischer et al. 2023; Li et al. 2024; Longato et al. 2024).

Forest pedagogy (FP) is regarded as an informational policy instrument targeting different groups (e.g., the public, stakeholders, policymakers, etc.), intending to promote understanding, use and application of the concept of sustainable development through the example of sustainable forest management (FCN 2017). It is recognized as an important tool for environmental education and public engagement, particularly across Europe. It is closely linked to broader international initiatives such as the EU Forest Strategy, the EU Biodiversity Strategy for 2030, and the United Nations' 2030 Agenda for Sustainable Development. Forest pedagogy is an experiential form of environmental education that is carried out by certified forest pedagogues and focuses on holistic personal development leading to a sustainable lifestyle (Marušáková et al. 2010).

In Slovakia, forest pedagogy has been systematically implemented since 2001, primarily aiming at education of children in kindergartens and elementary schools (Chlpošová 2021; Marušáková 2021). The forestry sector perceives its importance, especially in communicating professional topics (Jaloviarová et al. 2018). Based on the knowledge about forest ecosystems and experience in sustainable forestry, FP plays a key role in encouraging a positive perception of forestry among the public. It also fosters a relationship between the target groups and their environment (Marušáková 2009; FCN 2017). FP is not included in the formal education structure and is mainly carried out as extra-curricular activities, enriching the prescribed state educational program (Sarvaš & Chlpošová 2021). The activities of forest pedagogy are primarily targeted towards children and students of preliminary and elementary education (Chlpošová 2021; Kollárová & Nagyová 2022). Karavida et al. (2020) present forest pedagogy within forest schools as a suitable educational approach for preschool children, emphasising its social and health benefits for this target group. Few projects in the field of forest pedagogy systematically target youth. Macháčková (2021) examined the impact of forest pedagogy activities on problematic adolescents and their effectiveness in reducing aggression in a selected target group. Forest-based educational activities encourage critical thinking, teamwork, and leadership skills, which are needed for personal growth and future professional endeavours (Cont et al. 2023).

In terms of forest pedagogy, research from other countries confirms that forest pedagogy positively influences environmental knowledge, attitudes, and civic

engagement (Turtle & Convery 2015; Schneiderhan-Opel & Bogner 2021; Ardoin et al. 2022; Cont et al. 2023; Halla et al. 2023). However, despite its acknowledged benefits, the scientific exploration of forest pedagogy tends to focus more on its pedagogical (Karavida et al. 2020; Kollárová & Nagyová 2022; Dabaja 2023; Harris 2023) and social impacts (e.g., Van den Bosch 2017; Macháčková et al. 2021) rather than its role as a forest policy instrument. The relevance and role of FP within forest policy are acknowledged in Slovakia (Šálka et al. 2017; Marušáková 2021), but research on its effectiveness is absent.

Evaluating the effectiveness of policy instruments, including informational instruments like forest pedagogy, is crucial for understanding their impact on actor behaviour and policy objectives. Evaluation research is concerned with assessing the achievement of objectives or evaluating the reasons for the success and failure of public policy measures and programmes (Šálka & Šulek 2005; Krott & Suda 2007; Dobšínská et al. 2019). Furthermore, evaluation research examines how well informational instruments integrate within policy mixes to enhance policy coherence and public engagement in determining their contribution to forest policy goals.

Effectiveness evaluation is not concerned with economic efficiency but with the success of policy instrument implementation (Crabbé & Leroy 2008). It is usually based on objective indicators or theoretically defined criteria (Crabbé & Leroy 2008; Matei & Enescu 2013). However, as Shingler et al. (2008) point out, the subjective perception of the evaluated instrument's effectiveness by involved stakeholders is also essential. The objective criteria are the aims of forest pedagogy activities, and the subjective criteria are actors' perceptions.

Research on information instruments in forest management mainly focuses on knowledge transfer and providing advisory and extension services to current forest owners (Feliciano et al. 2019; Upton et al. 2019; Weiss et al. 2019; Lawrence et al. 2020). The effectiveness of advisory services (e.g., Dobšínská et al. 2019) or information campaigns (e.g., Wilkes-Allemand et al. 2021) was evaluated.

The paper aims to evaluate the effectiveness of forest pedagogy as an informational instrument. Using the project "LESU ZDAR¹", we assess the effectiveness of the forest pedagogy activities from the perspective of the involved actors – the target group, implementers, and project partners. The analysed project is the first to systematically work with the target group of youth in Slovakia.

The research was focused on evaluating the perceived effectiveness of individual actors and trying to find answers to the questions:

- How do different groups of actors perceive forest pedagogy activities?

¹ "Lesu zdar" refers to a traditional greeting used among foresters. It could be translated as "Long live the forest" or "Hello to the Forest".

- Can forest pedagogy be considered an effective forest policy instrument for raising youth awareness about the forestry sector?

The paper is structured as follows: the theoretical part describes the starting points; the methodological part presents the research design and methods. The results section evaluates (1) the effectiveness of FP activities from the perspective of the actors involved in the project “LESU ZDAR” regarding FP objectives and (2) the effectiveness of FP as an informational instrument focused on raising awareness about forest management. The discussion contrasts the results with existing research. In the final part, we formulate measures to improve the effectiveness of this instrument and identify future research needs.

2. Material a methods

Employing a mixed-method approach (Creswell 1999), we examined the perceived effectiveness of forest pedagogy activities implemented within the project „LESU ZDAR“. We evaluated the perceptions of three different groups of involved actors – the target group of school students, their teachers and forest pedagogues.

A combination of semi-structured interviews and document analysis was used to evaluate the extent of positive (+), negative (–), or neutral effect (+/–) of the activities towards fulfilling project goals and forest pedagogy objectives. Based on the analysis of strategic documents, we also analysed the contribution towards the support of policy objectives.

To identify perceptions and their change within the target group, we performed a secondary document analysis of surveys conducted with the participants before and after the project activities. The target group consisted of students between 14 and 17 years of age from three grammar and three vocational schools. A secondary analysis was conducted on 109 responses from the survey before the start of the project. The results were contrasted with the 65 responses from the survey carried out after the end of the project. Response rate to the final survey was 59.6%. The focus was on (1) identifying initial values, attitudes, and engagement linked to the environmental issues and forest ecosystems; (2) comparing the initial and final responses targeted towards influencing opinions, gaining new skills, and changing the future professional orientation of the students; (3) evaluating the project activities and final attitudes towards forestry and forest pedagogics by the target group. We did not carry out the surveys, the data was provided by the project administrator. A list of analysed questions from the initial and final surveys is provided in Appendix 1.

Secondary data analysis was conducted on five teacher interviews (R1–R5) collected and provided by the implementers of the LESU ZDAR pilot project. The main

aim was to gain an expert opinion on the effectiveness of forest pedagogy activities for the chosen target group. Teachers were asked to answer the following questions:

1. “LESU ZDAR” is a pilot project for upper secondary schools. In your opinion, did the activities of forest pedagogy carried out during the project suitably complement the State Educational Program? If yes, in which educational areas?
2. “LESU ZDAR” presented the forestry sector and its societal importance. Students could experience selected forestry activities (e.g., planting trees, research activities...). Have you observed a preference shift among students toward pursuing a profession within the forestry or nature-related sector?
3. The basic methodological approach of forest pedagogy activities aims to address participants’ HEAD (information), HANDS (hard and soft skills), and HEART (opinions, attitudes). Were all three components appropriately and evenly targeted during the activities? How were they developed, and in which activities precisely?
4. In your expert opinion (as a teacher), can you suggest any changes, additions, or improvements regarding project activities? Would you recommend continuing with a project targeting this group of participants?

When formulating questions for forest pedagogues, the main emphasis was on forest pedagogy and its role within environmental education and the forestry sector. This group was represented by four respondents directly involved in projects’ implementation (R6–10). Forest pedagogues involved in the “LESU ZDAR” project were employees of the National Forestry Centre, which coordinates forest pedagogy in Slovakia. Further questions were aimed at their opinions on the effectiveness of forest pedagogy as an informational policy instrument and identifying the conditions for its effectiveness. They were asked to summarise the project’s benefits, identify perceived changes within the target group, and propose improvements for future implementation. For this purpose, we asked the following set of questions:

1. Do you consider forest pedagogy to be an effective tool for working with the public or raising awareness and a positive image of the forestry sector?
2. What conditions must be met for forest pedagogy to change participants’ behaviour in activities effectively?
3. What is your vision or perspective regarding this project and working with this target group in the future?
4. From your point of view, did the project’s implementation provide new insights into the methods or areas that need attention within this target group?
5. Do you see potential for expanding the project’s activities?

When assessing the effectiveness of forest pedagogy as a policy instrument, we focused on its role in supporting informational policy instruments, as outlined in the theoretical framework of this paper. We analysed

whether they contributed (+) or not (–) to (1) transferring knowledge, (2) raising awareness, (3) enhancing public engagement, and (4) influencing decision-making/ changing the perception of actors.

2.1. Case study object: “LESU ZDAR” project

The project “LESU ZDAR – Forest Pedagogy for Secondary Schools” was a pilot initiative, operating under the National Forest Centre (NFC). NFC is a state forestry organisation and, on behalf of the Ministry of Agriculture and Rural Development, coordinates forest pedagogy in Slovakia. Certified forest pedagogues from the same institution carried out the project activities. The pilot was carried out from January to December 2023 in six secondary schools listed in Table 1. The target group consisted of students aged 14 to 17 who attended secondary vocational and grammar schools. In total, 109 students participated in the forest pedagogy activities. This demographic has historically been underrepresented in forestry education initiatives (Report on the Forest Pedagogy 2024); therefore, it was selected for the project.

The project’s primary objectives were to influence young people’s attitudes and values towards the forestry sector by presenting it as a modern and dynamic field. The main goals of the pilot were 1) introducing forestry as a modern sector, 2) influencing target groups’ values and attitudes towards the forestry sector, 3) building new skills among participants and 4) networking and curricular enrichment. The project incorporated experiential and exploratory learning and sensory perception elements, focusing on developing motor, social, and communication skills. Forest pedagogy activities included expert lectures, moderated discussions, and practical demonstrations in the field, with a strong emphasis on the involvement of forestry practitioners. Detailed information about the projects’ activities is listed in Appendix 2 and provided in the document LESU ZDAR! Methodological material for forest pedagogy activities intended for secondary schools (Výbohová 2024). Information about the project and all implemented activities is available at <http://www.lesnapedagogika.sk>.

3. Results

This section is divided into two parts, first, we evaluate the perceived effectiveness of the project “LESU ZDAR” by involved actors and second, we evaluate the effectiveness of forest pedagogy as an information policy instrument.

3.1. Perceived effectiveness of the “LESU ZDAR” project

There is a limited impact on influencing students’ attitudes toward forestry. Over 51% of students still perceived forestry as a traditional sector, even after participating in project activities. Similarly, the effectiveness in influencing career orientation within the target group was low. Contrary to the project goals, the percentage of students considering a career in forestry/environmental sciences decreased (see Fig. 1). Variability in the effectiveness of these efforts was observed among teachers and forest pedagogues, with teachers noting a highly individual impact on career orientation (R2–4). Factors such as financial incentives, job difficulty, and the need for systematic, long-term engagement were highlighted as significant influences on career choice by teachers.

On the other hand, all involved actors reported a high level of effectiveness in contributions to the educational process. After the project, 88.9% of students wanted to integrate forest pedagogy activities into the school curriculum. Additionally, over 87% of students found the activities informative and age appropriate. Teachers positively evaluated integrating theoretical knowledge with practical skills (R1–5) and the involvement of forestry experts in the activities (R6–10).

Experiential field activities received the highest level of positive feedback. Both students and their teachers reported a low rate of forest and nature visits. Teachers and forest pedagogues unanimously stated that most students had undertaken activities in the forest for the first time. This aligns with the questionnaire survey results before activities, where 48% of students stated that they visit the forest only occasionally or not at all.

The results underscore the project’s contribution to developing skills and competencies within the target group. For over 70% of students, the primary sources of

Table 1. Educational institutions involved in the pilot of “LESU ZDAR” project.

	Name of the educational institution, location		Responding teachers	Year of study / field of study
Grammar schools	Gymnázium L. Štúra	Zvolen	R1	I
	Gymnázium A. Sládkoviča	Banská Bystrica	R2, R3	I
	Gymnázium M. Rúfusa	Žiar nad Hronom	R4	I
Vocational schools	SOŠ pedagogická	Turčianske Teplice	R5	I / elementary pedagogy
	SPŠ S. Mikovíniho	Banská Štiavnica	—	I / biotechnology, pharmacy and environment
	SOŠ aropotravinárska a technická	Kežmarok	—	I–III / agricultural and technical studies

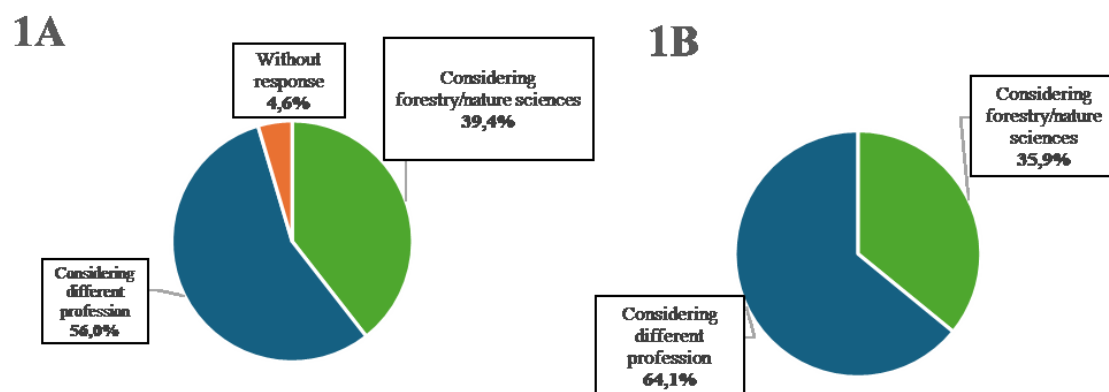


Fig. 1. Anticipated future professional engagement of target group within the forestry sector – before (1A) and after (1B) participating in projects' activities.

information on forest ecosystems were the Internet and school. By the end of the project, 82% of students and their teachers reported gaining new knowledge on the subject. Interviews with both teachers and forest pedagogues further supported this positive outcome. The project also fostered increased interest in environmental issues and student civic engagement. After completing the project, 41.5% of students expressed an active interest in addressing environmental concerns in their local communities. Moreover, 22% of students reported increased interest in active involvement in forestry and nature protection discussions. This amplified interest was further validated by interviews, which revealed that school environmental awareness primarily revolves around waste management and recycling.

Table 2 summarises the perceived effectiveness of FP activities in meeting the project objectives. The project was effective in education and fostering civic engagement, but less impactful in future career orientation and changing perceptions of the forestry sector among the target group.

3.2. Perceived effectiveness of forest pedagogy as an informational policy instrument

The “LESU ZDAR” project reflects the positive contribution of forest pedagogy to knowledge transfer in the project goals. Teachers and forest pedagogues confirmed the project's role in enhancing the knowledge and skills

of the target group. Additionally, two teachers stated that the project contributed to their professional development (R1, R5). They intended to integrate the acquired knowledge and practices into their future teaching, alongside continued collaboration with forest pedagogues. Three teachers (R1–3) highlighted alignment with the curriculum, emphasising forest pedagogy as an effective tool to complement and reinforce the target group's learning. The experiential nature of the activities was well-received, being described as engaging and appropriate. Both teachers and forest pedagogues positively evaluated the systematic approach and consistent engagement with the target group, identifying these as key success factors for integrating the knowledge into the participants' daily lives.

Teachers and forest pedagogues recognised forest pedagogy as an effective tool for raising awareness about forestry. Teachers noted that the activities enhanced students' understanding of the forestry profession's complexity and their professional knowledge of forestry and environmental education (R2–5). Moreover, one of the teachers (R2) highlighted the importance of FP activities within this target group as future forest owners or forestry professionals. The involvement of forestry professionals was identified as a key success factor in engaging students and fostering acceptance of the information provided. Forest pedagogues emphasised that the project increased awareness of the manifold forestry topics. The positive contribution of forest pedagogy towards raising awareness was also perceived among the target group. Throughout the project, interest in the subject remained

Table 2. Perceived effectiveness of FP activities among actors engaged in the “LESU ZDAR” project.

Project goals	Perceived effectiveness		
	Students	Teachers	Forest pedagogues
to introduce forestry as a modern sector	–/0	+	+
to influence the perception of the forestry sector	+/0	+	+
development of knowledge, skills, and attitudes within the target group	+	+	+
to influence the professional orientation of the target group	–	+/-	+/-
to encourage civic engagement in environmental topics	+	+	+
enriching educational practice	+	+	+
to create new partnerships	0	+	+

Notes: (+) positive perception – goal effectively achieved; (–) negative – goal was not fulfilled (+/-) neutral, in terms of goal achievement; (0) effectiveness could not be assessed.

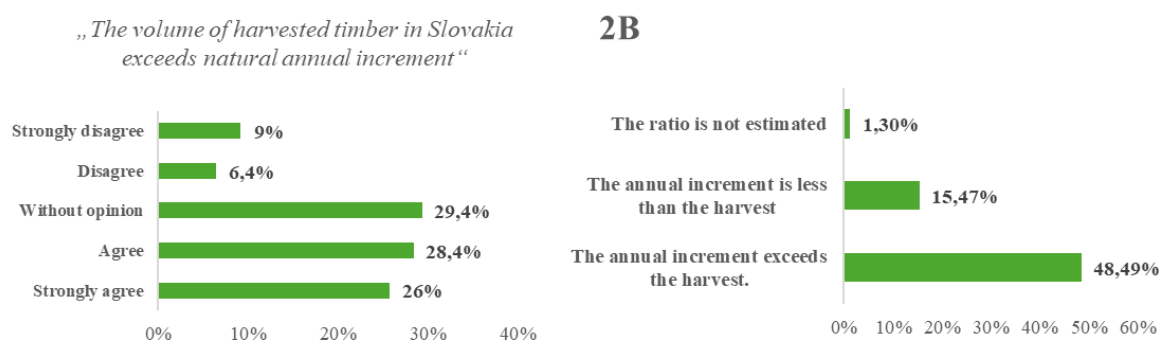


Fig. 2. Students' responses to a ratio between the annual increment and volume of timber harvested in Slovakia – initial (2A) and final (2B) survey.

high among the students (62.5%). The presented activities and topics frequently stimulated active peer discussions (25%) and encouraged independent searches for information online (17.2%). The positive effect on forestry awareness is evident when comparing students' pre- and post-project responses regarding wood production, as illustrated in Figure 2.

All involved actors recognised the positive impact of forest pedagogy in influencing civic engagement, as outlined in the previous chapter. Following the activities, the target group demonstrated increased interest in local environmental issues and a willingness to engage in theme-related discussions. Teachers and forest pedagogues also highlighted the role of forest pedagogy in fostering collaboration among institutions addressing environmental challenges. Teachers emphasised the significance of expert involvement and motivational approaches in engaging the target group. The research results did not confirm the impact of forest pedagogy on decision-making or changing perceptions among involved actors. Both teachers and forest pedagogues emphasised that long-term engagement with students is crucial for influencing attitudes and decision-making, noting that such changes are highly individual. Forest pedagogues perceived the activities to positively contribute to shaping students' attitudes and perceptions. At the same time, teachers found the effectiveness of this goal ambiguous while acknowledging the potential of forest pedagogy to shape their future opinions. From the students' perspective, the results did not indicate any significant impact on career orientation. The perception of forestry as a traditional industry persisted even after the activities. While the findings suggest a potential influence on attitudes toward the forestry profession, a more detailed analysis of the actors' group would be necessary for a definitive assessment. The evaluation of the perceived effectiveness of forest pedagogy as an informational policy instrument is presented in Table 3. While forest pedagogy activities contributed to the transfer of knowledge, raised awareness about forestry as a sector and profession and triggered civic engagement, long-term engagement with this target group is needed to influence their attitudes and decision-making.

Table 3. Perceived effectiveness of FP as an informational policy instrument.

Objectives of informational policy instruments	Actors		
	Students	Teachers	Forest pedagogues
Transfer of knowledge	+	+	+
Raising awareness	+	+	+
Enhancing public engagement	+	+	+
Influencing actors' decision-making/perception	–	+/-	+

Notes: (+) positive contribution towards the objectives (–) no contribution towards the objectives (+/-) neutral, in terms of activities' contribution towards the objectives.

4. Discussion

National and international strategic documents recognise informational instruments and their role in supporting forest and environmental policy objectives. Activities carried out in the project “LESU ZDAR” reflect on the National Forestry Program of the Slovak Republic 2025–2030 (2024). In its Strategic Goal XIV: Strengthening the social acceptability of the forestry sector, where forest pedagogy, among other informational instruments related to public relations, plays a key role. The thematic framework and support for building awareness and engagement is also in line with the objectives of the Environmental Policy Strategy of the Slovak Republic until 2030 (2019). Forest pedagogy is regarded as a part of environmental education in Slovakia (Marušáková et al. 2010), and by influencing the pedagogical process, it follows the Slovak Ministry of the Environment Departmental Concept of Environmental Education and Awareness by 2025 (MoE 2015). The forest pedagogy activities included in the project also contribute, by their nature and focus, to achieving the goals of the 2030 Agenda (UN 2015), EU Forest Strategy and EU Biodiversity Strategy for 2030.

Orientation towards the target group of youth and mediation of environmental issues in the form of experiential informal education also fulfils the objectives of The European Youth Goals (EU Youth Strategy 2019–2027), emphasising the importance of environmental education and active participation in the efforts to ensure sustainability, supporting activities also building

soft-skills essential for the future professional development. Targeting youth is essential for future decision-making and perceptions of forestry, especially within the group of future professionals and forest owners (Weiss et al. 2019; Wilkes-Allemann et al. 2021), as emphasised by teachers involved in the project. Engaging young people in forest-related education has the purpose of influencing their attitudes as they can become future decision-makers (R2). The main challenge is that young people are likely to migrate from rural to urban areas for education and employment opportunities, leading to a disconnect from forest communities and a decline in participation in local forest management (Matilainen et al. 2019; Robson et al. 2020). Youth often do not view forestry as a viable or attractive career path, resulting in limited interest in forest-related professions (Robson 2020), which was also confirmed in our case. Our results did not prove a positive contribution of forestry pedagogy to forming professional orientation in the target group. From the teachers' point of view, factors are more important for the target group, especially financial evaluation and application on the labour market when deciding on a future career. Forest pedagogues and teachers agree that the impact on professional orientation is highly individual and requires regular contact of the target group with professionals from the field of forestry. Direct contact with experts from practice helps to understand the profession and, in the long term, also to choose this profession (Searle & Bryant 2009).

Evaluating the effectiveness of forest pedagogy activities involves employing qualitative and quantitative methods to assess various indicators related to participants' learning outcomes, attitudes, and behaviours. Observational assessments were used to monitor participants' engagement, social interactions, and skill development during forest activities (O'Brien & Murray 2006). Self-report surveys and questionnaires were used to subjectively evaluate experiences, learning outcomes, and attitudinal changes (Ardoin et al. 2022). Interviews and Focus Groups collect in-depth qualitative data from participants, educators, parents, etc., to gain insights into perceptions and experiences (O'Brien & Murray 2006; Upton et al. 2019), and cognitive and skill-based assessments evaluate specific knowledge acquisition and skill development through tests or practical evaluations (e.g., Upton et al. 2019; Hepworth et al. 2024). Our applied methodological approach is in line with other studies in this field.

Experiential learning through forest pedagogy positively influences knowledge retention, attitudes, and behaviours toward forest management. Studies indicate that immersive, hands-on experiences in forest settings enhance the retention of ecological knowledge (Turtle & Convery 2015; Schneiderhan-Opel & Bogner 2021; Halla et al. 2023). In the above context, our research showed a positive assessment of mainly experiential forest pedagogy activities by interested actors.

The contribution of forest pedagogy to developing new knowledge and skills and building awareness, especially in further interest in the presented topics within the target group was confirmed. After the project, it was possible to observe an increased interest in active engagement in environmental issues among the target group, which teachers and forest pedagogues also confirmed. From the teachers' point of view, the presence of experts was a significant factor in increasing the acceptance of the presented information. On the other hand, the effectiveness of forest pedagogy activities in changing the view on forestry and the importance of a forester's work was disproved. In this context, the teachers and forest pedagogues emphasised the need for a systematic approach over a longer time to achieve the desired effects effect.

Implementing comprehensive forest education programs requires significant resources, including trained educators, access to forested areas, and funding, which may not always be readily available (Dabaja 2023). Educators may recognise the educational value of forests but often feel constrained by traditional curricula and safety concerns, which limit the implementation of outdoor learning initiatives like forest schools (Harris 2023). In Slovakia, one of the main reasons for the absence of similar activities in building environmental awareness is the belief of teachers that the activities are inappropriate for the curriculum, as well as the supposed low interest on the part of students (Bodáčzová et al. 2021). The results of our research showed that the target group, on the contrary, considered forest pedagogy activities to be appropriate and enjoyable and expressed interest in introducing them more often into the teaching process. Teachers also confirmed their appropriateness and connection with the curriculum. An assessment of the benefits in terms of the social behaviour of the target group was not carried out in this case, and further research is needed in this area.

This study presented the results of one specific case study, a pilot project. Therefore, broader conclusions should be drawn cautiously. A significant limitation is the short time frame of the study. Changes in opinions, attitudes, and behaviours toward forestry and environmental issues occur over an extended period. Since the project activities were conducted within a single year, the long-term impact of forest pedagogy on students' perceptions and professional orientation remains inconclusive. Future research should include longitudinal studies to assess whether these changes are persistent. Another limitation is the self-reported nature of the data collected from surveys and interviews. While these methods provide valuable insights into participants' perceptions, they are inherently subject to biases. Either participants respond in a way they believe is expected or have difficulty remembering experiences accurately. The reliability could be improved by conducting direct observations during project activities.

The response rate for the post-activity survey was lower than that before the initial study, which may have influenced the perceived effectiveness of the project. Participants who did not respond may have held different views, potentially affecting the results toward more positive impacts. Targeted incentives or follow-up reminders could increase the response rates in future studies. Lastly, the involvement of teachers and forest pedagogues in the study could also lead to potential biases in assessing the project's effectiveness. Experienced forest pedagogues may have had preconceived notions about the activities' impact, while teachers may have been impressed by them. Future research should include independent evaluations by external experts to reduce this potential bias. Despite these limitations, the study provides valuable insights into the role of forest pedagogy in environmental education and policy. Future research should focus on expanding the study, incorporating quantitative performance indicators, and exploring long-term effects on students' career choices and civic environmental engagement.

5. Conclusion

This study evaluated the perceived effectiveness of forest pedagogy as an informational policy instrument on the example of the pilot project "LESU ZDAR". The study confirms forest pedagogy's contribution to building environmental awareness and curricular enrichment. Students and teachers recognised forest pedagogy as a valuable experiential learning tool, with 88.9% of students supporting its integration into school curricula. The project successfully raised awareness about forestry. Students maintained an interest in forestry-related topics, mistaken beliefs about timber harvesting dropped and expressed interest in environmental issues.

Forest pedagogy has a strong potential to foster a positive human-forest relationship, particularly among future forest owners and professionals. By increasing knowledge and engagement, forest pedagogy can increase public trust in the forestry sector, improving the sector's acceptance and shaping long-term environmental behaviour. However, its impact on career orientation was limited, with the number of students considering a forestry-related profession decreasing from 39% to 36% post-project.

A systematic and continuous approach is the key to enhancing forest pedagogy's effectiveness. Engagement and long-term exposure to such activities are needed to influence involved actors' attitudes, decision-making, and professional ambitions. Future forest pedagogy initiatives as agreed by teachers and forest pedagogues should focus on continuous interaction with target groups, deeper integration into formal education, and collaboration with forestry professionals.

Further research is necessary to review forest pedagogy's long-term effectiveness as an informational policy instrument. Future investigation should focus on longitudinal studies and control-group comparisons to accurately estimate forest pedagogy's role in influencing environmental behaviour and forestry sector acceptance.

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Appendix 1

List of questions in the input and output questionnaire of the secondary analysis (Výbohová 2024)

Initial survey (before the project activities): 109 respondents				Final survey (after the project activities): 65 respondents			
Question No.	Question	Options	Percentage	Question No.	Question	Options	Percentage
2	Gender	Male Female Other	50.4% 47.7% 1.8%	1	Gender	Male Female Other	25.0% 75.0% —
3	Type of secondary school	Grammar school Vocational school	52.3% 47.7%	2	Type of secondary school	Grammar school Vocational school	50.0% 50.0%
10	Frequency of forest visits	Every day Once a week Once a month Occasionally Never	9.2% 35.8% 21.1% 44.0% 3.7%	—	—	—	—
6	Choose 3 most common sources of information about nature, the environment, forest, natural resources, and forestry	The Internet	78.9%	5	Were the information transferred during the course of “LESU ZDAR” project new to you?	The information presented was new for me	82.8%
		School	74.3%			The information presented confirmed and strengthened my current knowledge	12.5%
		Personal/direct experience	50.5%			The information presented was partially new, partially not	1.5%
		Television	48.6%			Presented information did not enrich my knowledge	3.1%
		Parents	45.9%	6	Were you interested in forest and forestry issues in your leisure time last year (2023) during the course of the project and after that?	Yes, I was reading the articles about the topic on the Internet	18.8%
		Friends and classmates	33.0%			Yes, I was discussing the topic with my family at home	17.2%
		Thematical lectures	22.0%			Yes, I was discussing the topic with my friends and classmates	25.0%
		Newspaper and magazines	21.1%			Yes, I was searching the information about the topics via magazines, books and TV programmes	1.5%
		Communication campaigns, posters and events	11.0%			No, I was not interested in the topic	37.5%
		I am not interested in this kind of information	8.3%				
5	My future occupation should be in connection with nature/forestry or environmental sciences	Yes No I have not decided yet	39.4% 56.0% 4.6%	4	My future occupation should be in connection with nature/forestry or environmental sciences	Yes No I have not decided yet	35.9% 64.1% 0.0%
16	How much do you agree with a statement: “The volume of harvested timber in Slovakia exceeds natural annual increment”	Strongly agree Rather agree Without opinion Rather disagree Strongly disagree	25.7% 28.4% 29.4% 6.4% 9.2%	10	In Slovakia, the ratio between the annual increment and volume of timber harvested is...	The annual increment is less than the volume of timber harvested The ratio is not estimated The annual increment exceeds the volume of timber harvested	23.8% 2.0% 74.6%
22	I have already planted a tree by myself	Yes No	62.4% 37.6%	16	I learnt how to plant a tree properly	Yes No	87.5% 12.5%
12	There is a custom to plant a tree during special occasions in my family	Yes No —	7.0% 93.0% —	9	I will suggest. planting a tree during special occasions in my family	Yes, because I like the tradition No, I do not like the idea I am not interested in this topic	81.0% 1.0% 18.0%

Initial survey (before the project activities): 109 respondents				Final survey (after the project activities): 65 respondents			
Question No.	Question	Options	Percentage	Question No.	Question	Options	Percentage
29	To improve the quality of the environment and life in Slovakia, the following 3 changes are necessary:	Increase the civic engagement and responsibility	46.8%	23	My own public responsibility and engagement in environmental issues is reflected when...	Recycling waste	27.7%
		Reducing erosion and air pollution	41.3%			I do not know/without response	16.9%
		Reducing or prohibiting tree felling	41.3%			Collecting waste or eliminating illegal dumping sites	15.4%
		Responsible management of natural resources	33.9%			Conscious behaviour in the forest and living sustainably	15.4%
		Increasing the quality of water; Increasing the abundance of wild fauna and flora	33% each			Minimising waste, adopting responsible consumption, shopping sustainably	15.4%
		Increasing the area of National Parks	27.5%			Using public transportation during travelling	7.7%
		Supporting voluntary initiatives	19.3%			Planting trees	1.5%
		Improving the quality of education	16.5%			I will be more engaged in environmental issues within my local area	41.5%
		Protecting the rights of forest owners	9.2%			I will be more involved in discussions about the nature protection and forest management	21.5%
		Increasing biodiversity; Supporting public transportation; Supporting domestic timber market	7.3% each	20	If you plan to be active in environmental issues, what will you do in that area?	I will further study nature sciences with a plan to pursue a profession in this area	10.8%
26	Currently, I am a member or supporter of a local initiative/non-governmental organization focused on environmental issues	Yes	2.8%			I will focus my lifestyle on activities that mitigate climate change impacts.	9.2%
		No	97.2%			I will not be active in these topics and I will avoid these themes	6.2%
						Other	10.8%
—	—	—	—	7	I perceive forestry to be...	A traditional sector	51.6%
						A modern and open sector	26.6%
						I do not have an opinion	21.9%
—	—	—	—	14	I perceive forestry profession to be...	Interesting work outdoors in the forest, requiring professional qualifications	47.6%
						Challenging outdoor work requiring practical skills and experience	33.3%
						Work outdoors as well as in the office	14.3%
						Occupation requiring specific education	3.1%
						Simple work without interesting activities and education	1.5%
—	—	—	—	18	Do you think that forest education activities should be a frequent part of the high school curriculum?	Yes	88.9%
						No	11.1%
—	—	—	—	19	Would you recommend the “LESU ZDAR” project to other students?	Yes	95.2%
						No	4.8%
—	—	—	—	24		Enjoyable, I had fun	46.9%
						Interesting, because I learnt something during the game	40.6%
						I do not have an opinion on that	7.8%
						Boring and useless	3.1%

Appendix 2

Activities of the pilot year of the project implemented with the target group (Výbohová 2024)

“LESU ZDAR” project design				
Name of the activity	Workshop: “Unlimited opportunities”	1 st day with a forester in a forestry institution	2 nd day with a forester in the forest	3 rd day with a forester “FOREST CAFÉ”
Date:	1 st –19 th May 2023	25 th May 2023	26 th –27 th October 2023	November 2023
Location of the forest pedagogy activities:	school classes	Technical University of Zvolen (virtual cave, laboratories, harvester simulator); Centre of excellence LignoSilva (3D CT scanner); Institute of forest ecology – Slovak academy of sciences (laboratories)	forest stands – municipal forests of Banská Bystrica, Banská Štiavnica, Kremnica, Spišská Belá, Banská Belá; State Forest Enterprise	school area, city café
Trainers involved:	forest pedagogues, school teachers	forest pedagogues, school teachers, researchers, professional staff, and lecturers from the institutions where activities took place	forest pedagogues, school teachers, forestry staff from municipality forests and State Forest Enterprise within the locations of forest pedagogy activities	forest pedagogues, school teachers
Main goal of the session:	introduction to topic and project executors; work with information, development of cooperation and presentation skills	introduction to the forestry sector and its importance; strengthening of theoretical knowledge via experiential activities; development of critical thinking	introduction of foresters work within the forest environment; strengthening environmental awareness; linking theoretical knowledge with practical activities	discussing gained information; sharing feedback after the activities; development of critical thinking and communication skills; cross-checking the information presented
Type of the activity:	workshop	excursion	practical activities in the forest	world-café
Methods used:	teamwork, work distribution based on individual preferences of students, interactive discussion	expert lecture with discussion, sensory perception activities, exploratory learning, work with technical appliances	exploratory learning, experience-based learning, peer-to-peer learning, development of hard skills, work with natural materials	moderated group discussion, self-evaluation, critical thinking activities