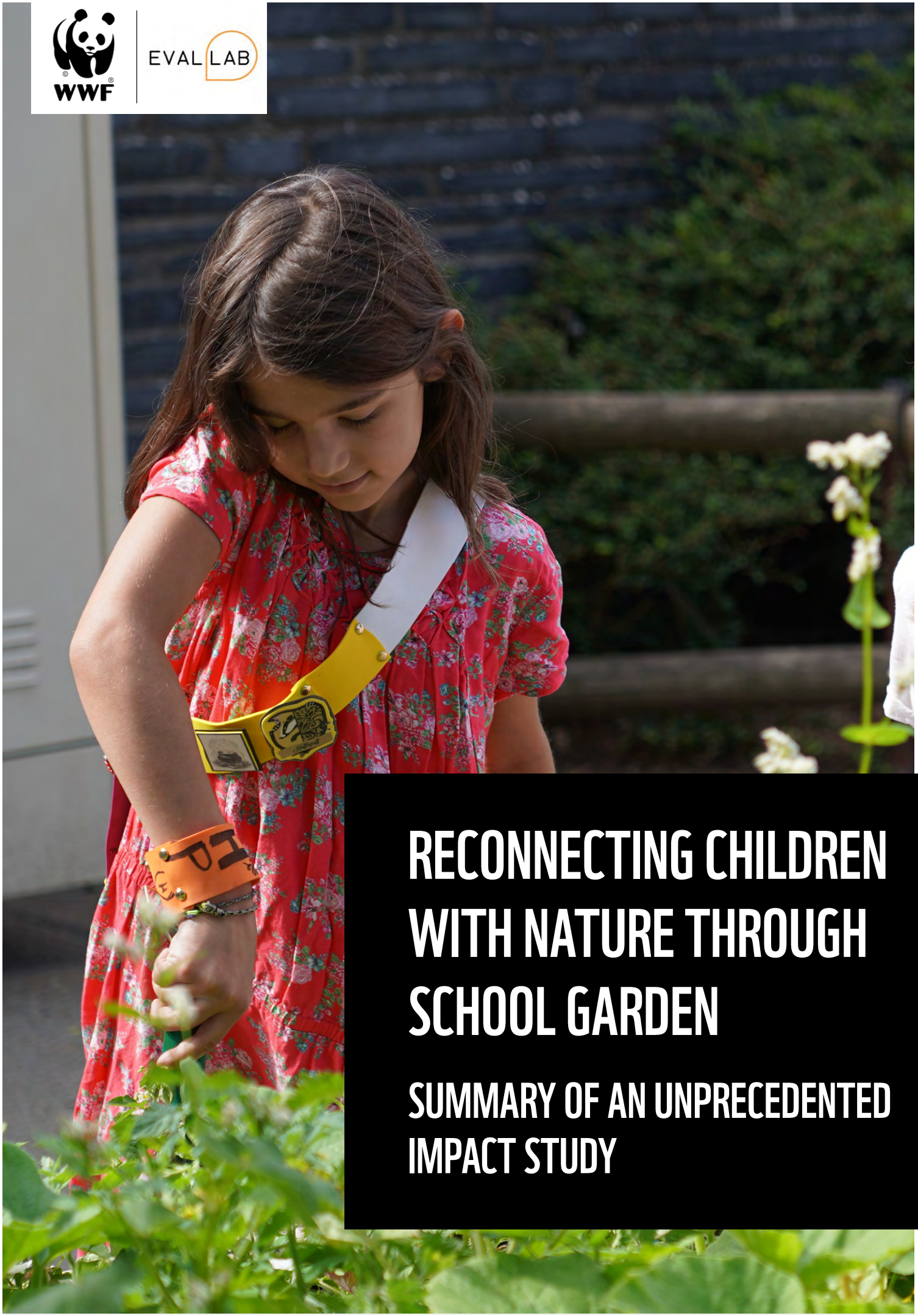

RECONNECTING CHILDREN WITH NATURE THROUGH SCHOOL GARDEN

SUMMARY OF AN UNPRECEDENTED IMPACT STUDY

WWF

The World Wildlife Fund (WWF) is one of the world's leading organisations dedicated to environmental protection. It operates in over 100 countries and is supported by nearly 6 million members worldwide.

WWF France, a recognised public-interest foundation, is committed to protecting the planet and safeguarding its long-term vitality and resilience. With offices in Paris, Marseille, the Alps, and New Caledonia, it carries out concrete actions to preserve natural environments and the species they support.

With the support of its volunteers and donors, WWF France promotes sustainable ways of living, trains decision-makers, collaborates with businesses to reduce their environmental footprint, and educates younger generations.

A key objective is to raise awareness among children from an early age about the importance of biodiversity and nature, encouraging them to become environmentally responsible adults and actively protect the environment.

This is our philosophy.

This is why, building on its expertise, WWF aims to place nature back at the heart of children's imagination and to support education professionals who are committed to fostering knowledge of the living world and nurturing young people's sensitivity to nature. To learn more about our initiatives for children and young people, please visit: https://www.wwf.fr/

Together we are the solution.

With contributions from: Marjolaine Girard (WWF), Lauranne Pellissier (WWF).

Eval-Lab : Scientific excellence driving social change

Eval-Lab is an organisation specialised in impact evaluation, data collection and analysis, research, and advisory services. Our team brings together experts, social science researchers, and professionals dedicated to programmes that contribute to building more just, equitable, and inclusive societies. With experience gained in leading academic and international institutions, we put our expertise at the service of associations, foundations, and international organisations. At Eval-Lab, we believe that lasting change is grounded in robust evidence. This is why we design and implement rigorous studies to generate knowledge that informs decisionmaking, implementation and strengthens the impact of programs and initiatives implemented by organizations we support.

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This study was commissioned by WWF-France and conducted by Eval-Lab.

Partners

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The team in charge of developing pedagogical activities linked to school gardens: Albane du Boisgueheneuc, Florence Sevin.

IDEE (Innovations, Data and Experiments in Education) is a centre of excellence dedicated to developing large-scale experimental research in education and promoting the use of its findings. The IDEE programme is funded for a period of eight years (2021–2029) by the French government through the National Research Agency (ANR), as part of the Investissements d'avenir programme (reference: ANR-21-ESRE-0034).

Acknowledgements

We would like to express our sincere gratitude to all the individuals and partners who contributed to this major study in the field of environmental education. In particular, we thank the Directorates for Education for Sustainable Development within the Ministry of National Education, as well as the CARDIE teams, for their support in disseminating the study; the Directorate for Evaluation, Forecasting and Performance (DEPP) of the Ministry of National Education; the association Teragir; the Café pédagogique; and all members of the Eval-Lab team who contributed to this work and successfully implemented a rigorous research protocol within a very short timeframe.

Finally, we warmly thank all the schools, teachers, students, and families who took part in this study and dedicated their time to responding to our requests and surveys. This study would not have been possible without you—particularly the schools in the comparison group, which fully adhered to their lottery assignment. Thank you for your commitment, your efforts, and your enthusiasm.

Report published in December 2025

SUMMARY

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CONTEXT

Without decisive action, **a child born in 2020 will face 7 times more extreme climate events than a child born in 1960**[1]. Yet, at a time when these risks are intensifying, human societies are becoming increasingly disconnected from nature, both physically and psychologically [2]. This disconnection is fueling a rising indifference towards the natural world and the environment[3].

Environmental education, a key driver for renewing interest in the living world

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In this context, **environmental education appears to have a key role to play in (re)connecting people to nature**[4]. This is true particularly during childhood, when children are naturally more connected to nature, and express stronger prosocial and altruistic preferences[5]. These preferences can, in turn, be shaped : experimental studies have shown that certain types of educational interventions can reinforce cooperative and environment-friendly behaviors[6]. Environmental education during childhood therefore represents a strategic opportunity to foster informed and engaged citizens, committed to protecting the environment and the common good.

The limits of information campaigns

Among existing programs evaluated in high-income countries, most primarily focus on providing information about the causes and consequences of climate change, as well as encouraging the reduction of emissions[7]. While these programs improve people's knowledge, they do not produce any lasting change[8]. To this day, there is no robust scientific evidence that shows that educational programs can systematically translate intentions into actions or sustained behaviours[9]. Worst still, by focusing on the consequences of climate change, these programmes may induce heightened ecoanxiety[10], often bringing coping mechanisms such as minimisation, distancing oneself from the anxiety-inducing information, and complete denial (*«Deemphasizing coping»*)[11].

1 Thiery et al., 2021.
2 Miller, 2005.
3 Mayer, 2018 ; Brenner et al., 2015.
4 Kellert et Wilson, 1993.
5 Fehr et al., 2013 ; Sutter et al., 2019.
6 Bettinger & Slonim, 2006; Kosse et al., 2020.
7 (Bottin et al., 2023).
8 Dijkstra et Goedhart, 2012 ; Brownlee et al., 2013.
9 Cordero et al., 2020.
10 Wang et Chen, 2022.
11 Ojala, 2012.

Despite an extensive scientific literature, research focusing on environmental education programs suffers from a lack of rigorous evaluations, often characterised by small sample sizes, limited external validity, and significant methodological biases[1]. We still have very limited reliable evidence to identify what truly works in changing the behaviours, practices, or environmental norms of future citizens.

Locally grounded projects focusing on children's connection to nature appear to be more effective

On the positive side, several promising recommendations are emerging. First, the local anchoring of programmes plays an essential role: it creates a form of environmental citizenship, rooted in the local community and reinforces collective preferences[2].

Second, connection to nature, i.e. the way people understand and perceive themselves as being part of the natural world, is systematically associated with better physical and mental well-being, as well as more pro-environmental behaviours[3]. This connection to nature is primarily developed through direct experiences with nature and of the natural world rather than through theoretical or classroom-based approaches[4].

Finally, the literature seems to indicate that the most eDective approach is to combine several different levers: cognitive, emotional and experential, rather than relying on a single approach[5].

This points to a major challenge to overcome: **designing programmes that can nurture positive emotional reactions, but also drive deep and lasting behavioural change.**

The pivotal role of teachers

In this regard, teachers play a pivotal role. While they show strong interest, they also express a clear need for support: 70% ask for ready-to-use resources, 60% wish for practical ideas of activities, and many call for dedicated school time and greater institutional recognition of the topic[6]. This tension is reflected in the Ecolhuma 2025 barometer of sustainable development education[7], which shows a clear drop in teachers interested in sustainable development education, falling from 84% to 54% in 2 years, driven by weariness, work overload, and the fact that the subject has become too political.

Nevertheless, schools and teachers are in the best position to mobilise and motivate future citizens and decision makers. It is therefore essential to provide them with tools that are appropriate, accessible, and suitable for all context, regardless of socio-economic background or geographic localization.

1 Bottin et al., 2023.
2 Bottin et al., 2023.
3 Barragan-Jason et al., 2021, 2023 ; Mackay & Schmitt, 2019 ; Whitburn et al., 2020.
4 Lumber et al., 2017 ; Barragan-Jason et al., 2021.
5 Bottin et al., 2023.
6 Ecolhuma, 2025.
7 Ecolhuma, 2025.

ENVIRONMENTAL EDUCATION AND SCHOOL GARDENS

School garden is a practical tool, sometimes perceived as (too) simple, yet it combines many of the recommendations outlined above. Far from being a new idea, there has been a long tradition of using school gardens, which developed alongside the promotion of learning in the open air and by experimentation. These ideas build on the legacy of thinkers and philosophers such as Rousseau, Montessori or Dewey, who have long promoted the concept of direct experience of the real world as a fundamental constituent of education[1].

The school garden : a universal, cross-cutting and adaptable tool

The school garden is a particularly fascinating tool, largely due to its universality: it is accessible to all students, whatever their age, social background or educational level. It provides a direct experience of nature: observing, touching, experimenting and it can be used as a background for more traditional activities or studies that are part of a curriculum, such as the study of living systems, or real application physical education, and mathematics or even reading and oral expression.

The garden can also be brought into the classroom through activities such as soil exploration, planting, and germination experiments, and can be used throughout the year, including during the winter months. It can also facilitate intergenerational learning, as children can bring home elements of the garden and share what they have learned at school with their families, as shown in the literature[2].

The vegetable garden is also very adaptable: it can take different forms depending on each school's context, such as being in the ground, in soil-filled containers , in pots, inside or outside the school premises. Each project can be designed to suit the available space, the budget and the creativity of the school staff.

The school garden is a powerful tool to reinforce children's connection to nature, to generate positive emotions and encourage long-term sustainable behaviours, all that at a reasonable cost.

Many existing gardens, but often underused, and numerous barriers

As a consequence, many schools in France already have a school garden, but the exact number or the usage made of the school garden is unknown.

1 Desmond, Grieshop et Subramaniam, 2002 ; Subramaniam, 2002 ; Trelstad, 1997.
2 Lawson et al., 2019 ; Crandon et al., 2022.

This survey also shows that **90% of teachers** have never received any specific training on how to use a school garden. They express a strong need for support, and specifically ask for simple resources and activities that can be integrated into the curriculum throughout the year.

In order to prepare this study, the research team conducted an initial survey with 500 schools with a school garden. The initial study highlights that, despite its considerable potential, the school garden remains largely underutilised: most teachers use it only occasionally, and those who do devote limited time to it.

The sutyd also identifies additional obstacles, aligned with the findings of other studies[1]: the difficulty of organising activities in the school gardens with a large group of students, the idea that these gardens can only be used at the end of the school year (spring and summer), the belief that the school garden is only a pastime and not a proper learning tool (which can generate feelings of guilt among teachers when faced with the attitude of peers or parents), or even a productivist approach where one feels compelled to plant, grow or harvest "successfully". Generally speaking, the mere presence of a school garden is not sufficient: it is essential to equip and train teachers so they can fully leverage this resource and unlock its full educational potential.

The school garden thus emerges as a promising educational tool, which remains largely unused and whose potential has yet to be fully realised.

1 Ozer, 2007 ; Azuma, Horan et Gottlieb, 2001

THE WWF FRANCE "ÉCOLE JARDINIÈRE » PROGRAM : SUPPORTING TEACHERS

The WWF France "École Jardinière" program sets out to boost interest in educational gardens in schools and to publicise the program in order to achieve in the long-term aregular, widespread use of these gardens. In response to the needs expressed by teachers in the preliminary survey, WWF developed and provided high quality educational tools, aligned with the school curriculum. In addition, WWF handed out ready-to-use activity sheets for gardening workshops, to be done either in the classroom or in the garden. These materials were designed to be immediately usable and to require no prior training for teachers.

The program is based on the assumption that this support will increase the time students spend on environmental education activities related to the school garden, and increase their exposure to experiential learning about the living world. In turn, these experiences are expected to strengthen pupils' connection to nature, their ecological awareness and their pro-environmental behaviours, with potential spillover effects within families.

Adapted and ready-to-use pedagogical resources

The École Jardinière program is an online toolkit that teachers can access free of charge. In order to measure the program's impact, 17 École Jardinière activities were selected, revised, organised and sent to teachers by mail in four installments between December 2024 and May 2025. Some of these activities focus on studying the living world in general (for example, exploring soil composition) and can be carried out in the classroom or outdoors. Others are specifically designed for the school garden, allowing pupils to discover and experiment with nature in a practical way and learn through hands-on experience. The packages also include seeds, enabling pupils to carry out planting and germination activities with no additional requirements from the teachers.

Thanks to these activities, the time teachers devoted to environmental education related to the school garden increased by 50%, from 12 to 18 hours over the year of the study.

Teachers express a high level of satisfaction with the program, highlighting the quality of the materials provided, the ease of implementation and the wealth of teaching suggestions, which are perceived as stimulating and suitable for a wide variety of contexts. In line with the results of the Ecolhuma barometer (2025), this type of program directly responds to the needs expressed by teachers for concrete, ready-to-use and easily accessible resources for environmental education activities.

Example of printed activities sent to schools

ASSESSING THE IMPACT OF SCHOOL GARDENS AND EDUCATIONAL GARDENING

To assess the impact of this program, Eval-Lab implemented a randomised controlled trial, a method recognised for its scientific rigour and transparency, and its ability to isolate and measure the unbiased effect of an intervention or a program.

Why is it difficult to measure the impact of a program ?

If children in schools with vegetable gardens express a strong connection to nature and good environmental practices, several questions arise: is this due to the vegetable garden, or the child's environment (parents, school, surrounding nature), or a combination of both? It is important to note that correlation does not necessarily imply causation: only a rigorous impact evaluation can determine whether there is a causal link between the use of a vegetable garden and connection to nature[1].

Defining the social impact of a project

The social impact of an intervention is defined as the comparison between (i) 'what I have become as a result of an intervention' and (ii) 'what I would have become without that intervention'. Since the latter situation is by nature unobservable, the evaluator must use a comparison group that mimics what the beneficiary group would have become if it had not benefited from the intervention. The difficulty of a rigorous impact evaluation lies in identifying a credible comparison group that is equivalent to the beneficiary group before the intervention, so that any differences that arise between the two groups following the program are exclusively due to the program and not to initial differences between the two groups. A rigorous and transparent method for constructing this comparison group is called a randomised control trial.

Randomised control trial evaluation

In a randomised evaluation, the beneficiary group and the non-beneficiary group are selected at random from a sample of subjects eligible for the intervention. Random assignment, based on a sufficiently large sample, makes it possible to form groups that are similar on average at the start of the program. In this way, and provided that the program and evaluation have been properly designed and implemented, any differences that subsequently arise between participants in the two groups can be interpreted as the effect of the intervention rather than due to other factors. This difference therefore provides a reliable estimate of the impact of the program being evaluated.

1 More broadly, having reliable and methodologically sound impact studies helps shed light on the dynamics of social change. Credible evidence helps organisations to better understand the e[ects of their actions, adjust their strategies when necessary and, more generally, strengthen the relevance of their interventions.

A VERY LARGE SAMPLE TO ENSURE A RIGOROUS STUDY

89
primary schools across France[1]

184
teachers

+ over 3,500
pupils

In this study, several key factors were measured among pupils: their connection to nature, their environmental awareness, their pro-environmental behaviours and their mental well-being. To assess these different aspects, the research team used standardized scales validated by scientific literature and collected through paper and electronic questionnaires. Information was also gathered from school administrators, teachers, and parents. Overall, this study has made it possible to compile for the first time at this scale worldwide, a unique body of data aimed at better understanding the pro-environmental profile of teachers, students, and their families, as well as the links that may exist between these different actors.

COLLABORATION WITH EXPERT RESEARCH TEAMS

To conduct this scientific study, Eval-Lab built a multidisciplinary team of researchers from the universities of Montpellier, Toulouse, Bordeaux and the CNRS. By combining approaches from economics, psychology, ecology and sociology, this team brings together the expertise needed to conduct a truly multidimensional and rigorous study, capable of producing robust, useful results, enabling concrete action for WWF France and all stakeholders in education.

CHARACTERISTICS OF THE SCHOOLS IN THE STUDY SAMPLE

The 89 primary schools enrolled in the study are spread across the entire metropolitan area and have very diverse profiles. This diversity offers interesting variability and contributes to the overall representativeness of the sample. On average, the schools have 9 teachers and 165 pupils, ranging from CP to CM2. They display diverse socioeconomic profiles: 13% belong to the priority education network (REP) and the average social position index[2] (IPS) is close to the national average. Furthermore, 71% of the schools are public and 29% are private, a distribution that is slightly more skewed towards private schools than the national average (around 18%).

1 The restriction of the study to metropolitan France was not a methodological choice on our part. The study was open to and communicated to all schools in France, but no schools outside metropolitan France participated.

2 The Social Position Index (IPS) of a school is an indicator calculated by the Directorate for Evaluation, Forecasting and Performance (DEPP). It summarises the socio-economic and cultural conditions of the families of the pupils attending the school. The IPS thus makes it possible to report on the social disparities that exist between schools and within the same schools.

Participating schools and existing school gardens

Among the establishments enrolled in the study, 74 already had a school garden. These school gardens were mainly set up following the initiative of teachers and/or school management. The majority of these schools had a school garden in the ground and/or in containers.

Teachers are generally convinced of the usefulness of school gardens in developing environmental values, but many find it difficult to organize activities related to school gardens, and nearly 90% would like advice and support to be able to make effective use of school gardens with their pupils.

Randomised evaluation in practice

Eval-Lab conducted a stratified random lottery that assigned 45 schools to the beneficiary group in which teachers received the École Jardinière activities during the 2024–2025 school year, and 44 schools to the comparison group, which did not receive these materials. Two series of data collection were carried out in all schools: the first at the beginning of the school year, in September/October 2024, and the second at the end of the year, in June 2025.

High level of participation by teachers, pupils and their parents

In the 89 schools included in the evaluation, 184 teachers and their classes participated in the study. Teachers are on average 44 years old, have been at their current school for 8.5 years and have nearly 17 years of teaching experience. They express a high level of professional satisfaction: nearly 90% say that if they had to make the choice again, they would choose to be a teacher. At the same time, 90% of them feel that their profession is not sufficiently valued in society.

In total, more than 3,500 pupils took part in the study. Eval-Lab collected questionnaires at the beginning and end of the year from 87% of them, a particularly high response rate. All primary school levels are represented, with approximately 700 pupils per level, from CP to CM2. Finally, a questionnaire sent to families at the end of the year received more than 700 responses, representing a response rate of 20%.

Characterisation of pupils: environmental profile

Thanks to the size of the sample and the wealth of data collected, it is possible to examine in detail the profile of the pupils, as well as the relationships between the different dimensions measured and studied. This section presents the main findings emerging from the analysis, which are consistent with evidence from studies conducted in other contexts around the world.

Students show a strong connection to nature, reflecting the 'natural biophilia' characteristic of childhood[1]. Children feel deeply connected to the natural world. However, this connection tends to diminish with age: as children grow older, they report a significantly weaker sense of belonging to nature. This phenomenon, documented in various contexts, shows a gradual decline in connection to nature, which generally reaches its lowest level at the end of adolescence, around ages 15 to 17[2].

1 Kellert et Wilson, 1993.
2 Voir par exemple Barragan-Jason *et al.*, 2025 ; Hughes *et al.*, 2019 ; Richardson *et al.*, 2019.

Students who feel more connected to nature tend to have higher levels of mental well-being, greater environmental awareness, and better proenvironmental behaviours. The analysis highlights a positive association between connection to nature and these diDerent dimensions: the more a child reports feeling connected to the natural world, the more likely they are to express greater mental well-being, stronger environmental awareness, and proenvironmental behaviors.

Marked territorial inequalities appear, closely linked to the socio-economic profiles of the pupils. Pupils enrolled in REP schools, who represent 30% of the sample, mostly live in urban areas with little vegetation or nature. They report a weaker connection to nature, more limited pro-environmental behaviours and a lower level of eco-anxiety compared with other students.

The role of childhood and family socialisation also appears to be decisive. Data suggests that parents who grew up spending more time in nature develop a stronger connection to the natural world as adults and are more likely to adopt pro-environmental behaviours. Furthermore, a strong connection to nature among parents is associated with a stronger connection among their children, as well as more assertive pro-environmental behaviours.

THE IMPACT OF THE «ÉCOLE JARDINIÈRE» PROGRAM

Pupils spend more time on school activities related to environmental education linked to the school garden. Thanks to the École Jardinière support program, teachers are increasing the number of sessions devoted to the school garden (+5.8 sessions from December 2024 to June 2025), whether they happen in the classroom or outside. This translates into a significant increase in the time allocated to these activities, with approximately 6 additional hours, or a 50% increase over one year.

The programme significantly improves children's connection to nature, their environmental awareness, and their reported pro-environmental behaviours. In absolute terms, the estimated effects on these factors are only moderate in magnitude. However, when considered in relation to the program's low intensity, short duration, and very low cost, the impact achieved appears substantial and particularly encouraging. Furthermore, the program does not increase ecoanxiety among pupils, which is an important result compared to other programs that can generate an increase in eco-anxiety as a side effect. On the other hand, no significant effect was observed on children's self-reported mental well-being at school.


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The effects of the program are particularly pronounced among pupils enrolled in REP schools. Analyses show that these pupils make significantly greater gains in terms of connection to nature, environmental awareness and reported pro-environmental behaviours . This result confirms that the program primarily benefits pupils who are furthest removed from nature in their everyday environment. It thus plays a catch-up role, since pupils in REP schools initially had a less developed environmental profile than their peers in non-REP schools. However, the study also highlights an increase in eco-anxiety among these pupils, even though their initial level was lower. This is an important point to consider in the design and future adaptation of this type of program to maximize educational and environmental benefits while preventing any undesirable effects.

The program's effects on environmental awareness are consistent across all student profiles, demonstrating that it broadly enhances their environmental consciousness. However, the impacts on connection to nature and pro-environmental skills vary according to the characteristics of the pupils. They are particularly marked among girls and pupils who were initially less connected to nature. These results suggest that the program has differentiated effects and can respond in a targeted manner to the needs of certain subgroups of pupils.

The program does not appear to have a significant effect on teachers' perceptions or practices. Overall, no statistically significant impact was observed on their connection to nature, their pro-environmental skills or their job satisfaction. These results should, however, be interpreted with caution, given the

1 The size of the statistical effects can be interpreted in light of international standards in education, which empirically categorise the magnitude of effects based on hundreds of studies in the field. In our case, the effects produced by the programme fall into the 'moderate' category, compared to the adjacent categories of "weak" or 'strong' effects.

small sample size at the teacher level and the voluntary recruitment process, which results in a group of teachers already highly sensitised to environmental issues.

In terms of teaching, the program does not change pupils' behaviour in class, whether in terms of attention, cooperation or the general classroom atmosphere. However, there has been a significant increase in the number of disciplinary measures in schools participating in the École Jardinière program. This increase can be explained by the difficulty teachers have in managing a whole class during outdoor activities, where some pupils perceive these moments as times for relaxation or play, which can encourage disruptive behaviour. This result highlights an important point for future adaptation of this type of program: strengthening support for teachers in managing the group outdoors and further integrating the development of psychosocial skills to help pupils adopt appropriate behaviour during these activities.

SCHOOLG GARDENING PRACTICES AND ASSOCIATED EFFECTS: INSIGHTS FROM A QUALITATIVE APPROACH

In order to supplement the quantitative analyses presented above and to better understand the use of the 'École Jardinière' program and the short-term effects of school gardens on children, Eval-Lab conducted interviews with seven teachers.

The conclusions of these interviews broadly concur with those of the quantitative study, particularly with regard to the development of environmental awareness. However, some results differ: teachers report positive short-term effects on pupils' well-being, motivation and several psychosocial skills such as inclusion and cooperation[1].

€

€30
per pupil in a school with 150 pupils

€1.38
per pupil per year for sending out activities

Estimated return of

3.35€
per euro invested

HOW MUCH DOES A SCHOOL GARDEN COST?

The cost of a school garden
School vegetable gardens take many diDerent forms depending on the school: in open ground, in containers or planters, built all at once or developed gradually over the years. Each school can therefore design a garden that suits its budget, space and identity. It is therefore difficult to provide a standard cost, as there are many different possible configurations. Among our study sample, the budgets allocated to school gardens ranged from a few hundred euros to tens of thousands of euros, reflecting this significant diversity. In addition to these initial investments, there are recurring expenses for equipment, soil and seeds. On average, the initial cost of a vegetable garden is estimated to be around €4,000, or less than €30 per pupil in a school with 150 pupils.

The educational program associated with the school garden
Apart from the cost of designing the "Ecole Jardinière" program, sending activities to teachers represents a very low expense. In this study, the four mailings sent during the school year cost €42 per class, or approximately €1.38 per pupil for a class of 30 pupils.

Socio-economic analysis of the school garden
A socio-economic analysis conducted in parallel with the impact study highlights the cost-effectiveness of school gardens : for every euro invested, the estimated long-term return for the community is €3.35.

1 Some of these e[ects, particularly those related to wellbeing, may be felt at the time but then fade quickly, especially given the low intensity of the intervention. This could explain why they do not appear in the quantitative assessment.

CONCLUSION AND RECOMMENDATIONS

One of the major strengths of this study is that it evaluates a program as it is actually implemented in the field, without any special support, dedicated training or close supervision by a research team. The intervention was entirely implemented under 'ecological' conditions: teachers used the program as they would have done in practice, with their time constraints, trade-offs and natural level of commitment. The impact measured therefore corresponds to a 'real' impact, i.e. the impact that can reasonably be expected from large-scale deployment, without intensive or unrealistic support measures. This characteristic makes the results particularly credible, transferable, and directly useful for public and policy decision-making.

The study's findings clearly that the school garden is a credible and effective tool for environmental education, capable of generating significant impacts on children's engagement and their relationship with the living world. However, their use and impact is not automatic: they require adequate guidance and structured support. In the perspective of a scale up of the program or of activities similar to the École Jardinière, several elements deserve particular attention.

School gardens must be accompanied by practical, simple and directly applicable activities so that teachers can truly exploit its full potential.

Generally speaking, the mere presence of an existing infrastructure does not guarantee its use: teachers need support to take ownership of school gardens and turn them into a real teaching tool and opportunity. This is particularly true for schools and teachers who are less familiar with environmental education or who need extra support to ensure effective adoption. Furthermore, the study is based on a sample of schools and teachers who volunteered to participate and who were already sensitive to these issues. It is therefore all the more essential to support less committed teachers so that they, too, can adopt the tool and benefit from simple, tailored activities. The impact could be even greater on these teachers and their pupils.

Helping teachers overcome limiting perceptions. Support for schools and teachers must help them move beyond the perception of vegetable gardening as a leisure activity, both from peers and parents. In order for a school garden to be fully utilised, it must be recognised as a credible educational tool, capable of supporting practical learning, enriching the relationship with the natural world and mobilizing various skills. This recognition is an essential condition for giving school gardens a real place in everyday classroom life. Beyond this necessary evolution, it is also important to break with the productivist vision often associated with gardening. The challenge is not to "succeed" in producing, harvesting, or feeding a class, but to promote the garden as a space for observation, trial and error, and exploration. It is these factors, and not just yield, that make a school garden a rich educational tool. **The learning processes, discoveries, and even failures must be considered legitimate and valuable components of the**

educational experience in the garden.

Supporting the formalization of the educational project. The educational activities offered can be fully aligned with the school curriculum for pupils at all levels of primary education, in the five areas of fundamental knowledge and skills acquisition, as defined by the French Ministry of Education[1]. In general, it is possible to offer teachers simple activities in the school garden that allow them to work on fundamental skills in life sciences, English or even mathematics, while providing an experience of nature that stimulates the development of a connection to nature and pro-environmental behaviours.

Integrating socio-emotional development activities. The school garden is not only a learning tool: it is a powerful place for developing social relations, to promote the development of essential socio-emotional skills, such as perseverance, empathy, cooperation and emotion management, which play a decisive role in the sustainable adoption of environmental practices and the emergence of a deep environmental awareness. It is important to design activities in the school garden that are explicitly geared towards developing these socio-emotional skills. Strengthening these skills is a major lever for guiding children towards sustainable change, both in their personal development and in their commitment to the environment.

Involving all stakeholders in the educational community. The school garden can become a unifying force that extends far beyond the school. To encourage this dynamic, it would be a good idea to establish regular times when the garden is open to the community – participatory days, collective projects, intergenerational workshops, visits from pro-environmental NGOs or municipal gardeners. These events strengthen the link between the school and its environment, lightening the workload for teachers and enriching the educational experience for pupils. By anchoring the school garden in local life, the school turns it into a genuine joint project, sustainable and supported by all stakeholders.

1 Languages for thinking and communicating, methods and tools for learning, personal and civic education, natural and technical systems, and representations of the world and human activity. © Mélanie Ogloza / WWF-France 18

BIBLIOGRAPHY

Azuma, A., Horan, T., & Gottlieb, R. (2001). A place to grow and a place to learn: School gardens in the Los Angeles Unified School District. A survey, case studies, and policy recommendations. Los Angeles: Center for Food & Justice, Urban & Environmental Policy Institute, Occidental College.

Barragan-Jason, G., Cauchoix, M., Diaz-Valencia, P. A., Syssau-Vaccarella, A., Hemet, S., Cardozo, C., ... & Parmesan, C. (2025). Human–nature connectedness and sustainability across lifetimes: A comparative cross-sectional study in France and Colombia. *People and Nature*, 7(1), 99-111.

Barragan-Jason, G., de Mazancourt, C., Parmesan, C., Singer, M. C., & Loreau, M. (2021). Human–nature connectedness as a pathway to sustainability: A global meta-analysis. *Conservation Letters*, 15, e12852.

Barragan-Jason, G., Loreau, M., de Mazancourt, C., Singer, M. C., & Parmesan, C. (2023). Psychological and physical connections with nature improve both human well-being and nature conservation: A systematic review of meta-analyses. *Biological Conservation*, 277, 109842.

Bettinger, E., & Slonim, R. (2006). Using experimental economics to measure the effects of a natural educational experiment on altruism. *Journal of Public Economics*, 90(8-9), 1625-1648.

Bottin, M., Pizarro, A. B., Cadavid, S., Ramirez, L., Barbosa, S., Ocampo-Palacio, J. G., ... & Zanfini, L. (2023). Worldwide effects of climate change education on the cognitions, attitudes, and behaviors of schoolchildren and their entourage. *AFD Research Papers*, (299), 2-68.

Brenner, S.L., Jones, J.P., Rutanen-Whaley, R.H., Parker, W., Flinn, M.V., Muehlenbein, M.P, (2015). Evolutionary mismatch and chronic psychological stress. *J. Evol. Med.* 3, 1–11

Brownlee, M. T., Powell, R. B., & Hallo, J. C. (2013). A review of the foundational processes that influence beliefs in climate change: Opportunities for environmental education research. *Environmental Education Research*, 19(1), 1-20.

Cordero, E. C., Centeno, D., & Todd, A. M. (2020). The role of climate change education on individual lifetime carbon emissions. *PLOS One*, 15(2), e0206266.

Crandon, T. J., Scott, J. G., Charlson, F. J., & Thomas, H. J. (2022). A social–ecological perspective on climate anxiety in children and adolescents. *Nature Climate Change*, 12(2), 123-131.

Desmond, D., Grieshop, J., & Subramaniam, A. (2002). Revisiting garden based learning in basic education. Food and Agriculture Organization of the United Nations and International Institute for Educational Planning.

Dijkstra, E. M., & Goedhart, M. J. (2012). Development and validation of the ACSI: Measuring students' science attitudes, pro-environmental behaviour, climate change attitudes and knowledge. *Environmental Education Research*, 18(6), 733-749.

Ecolhuma (2025). Baromètre sur l'éducation au développement durable 2025.

Fehr, E., Glätzle-Rützler, D., & Sutter, M. (2013). The development of egalitarianism, altruism, spite and parochialism in childhood and adolescence. European Economic Review, 64, 369-383.

Hughes, J., Rogerson, M., Barton, J., & Bragg, R. (2019). Age and connection to nature: when is engagement critical?. *Frontiers in Ecology and the Environment*, 17(5), 265-269.

Kellert, S.R., Wilson, E.O, 1993. *The biophilia hypothesis*. Island Press.

Kosse, F., Deckers, T., Pinger, P., Schildberg-Hörisch, H., & Falk, A. (2020). The formation of prosociality: causal evidence on the role of social environment. *Journal of Political Economy*, 128(2), 434-467.

Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., L. Strnad, R., & Seekamp, E. (2019). Children can foster climate change concern among their parents. *Nature Climate Change*, 9(6), 458–462.

Lumber, R., Richardson, M., & Sheffield, D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. PLOS One, 12(5), e0177186.

Mackay, C. M. L., & Schmitt, M. T. (2019). Do people who feel connected to nature do more to protect it? A meta-analysis. *Journal of Environmental Psychology*, 65, 101323.

Mayer, F. S. (2018). In: *Transforming psychological worldviews to con-front climate change: A clearer vision, a different path*. California:University of California Press

Miller, J.R.,(2005). *Biodiversity conservation and the extinction of experience*. TRENDS Ecol. Evol. 20.

Ojala, M. (2012). Regulating worry, promoting hope: How do children, adolescents, and young adults cope with climate change?. *International Journal of Environmental and Science Education*, 7 (4), 537–561.

Ozer, E. J. (2007). The effects of school gardens on students and schools: Conceptualization and considerations for maximizing healthy development. *Health education & behavior*, 34(6), 846-863.

Richardson, M., Hunt, A., Hinds, J., Bragg, R., Fido, D., Petronzi, D., ... & White, M. (2019). A measure of nature connectedness for children and adults: Validation, performance, and insights. *Sustainability*, 11(12), 3250.

Subramaniam, A. (2002). *Garden-based learning in basic education: A historical review. Monograph*. Centre for Youth Development, University of California, 1–12.

Sutter, M., Zoller, C., & Glätzle-Rützler, D. (2019). Economic behavior of children and adolescents–A first survey of experimental economics results. *European Economic Review*, 111, 98-121.

Thiery, W., Lange, S., Rogelj, J., Schleussner, C.-F., Gudmundsson, L., Seneviratne, S. I., Andrijevic, M., Frieler, K., Emanuel, K., Geiger, T., Bresch, D. N., Zhao, F., Willner, S. N., Büchner, M., Volkholz, J., Bauer, N., Chang, J., Ciais, P., Dury, M., … Wada, Y. (2021). Intergenerational inequities in exposure to climate extremes. *Science*, 374(6564), 158–160.

Trelstad, B. (1997). Little machines in their gardens: A history of school gardens in early America, 1891 to 1920. *Landscape Journal*, 16(2), 161–173

Wang, X. Q., & Chen, J. (2022). Fear emotion reduces reported mitigation behavior in adolescents subject to climate change education. *Climatic Change*, 174(1–2).

Whitburn, J., Linklater, W., & Abrahamse, W. (2020). Meta-analysis of human connection to nature and proenvironmental behavior. *Conservation Biology*, 34(1), 180–193.

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