

ECO-LITERACY IN PRESCHOOL: AN EVIDENCE-BASED STUDY COMPARING THE MONTESSORI METHOD AND THE COMMON METHOD OF SUSTAINABILITY EDUCATION USING ECO-FABLES

L'ECO-LITERACY NELLA SCUOLA DELL'INFANZIA: UNA RICERCA EVIDENCE BASED TRA METODO MONTESSORI E METODO COMUNE DI EDUCAZIONE ALLA SOSTENIBILITÀ CON LE ECO-FAVOLE

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ABSTRACT: Introduction: The opening of the Agenda 2030 «We imagine the world...» prompts a reflection on how imagination is a strategic key in sustainability education and how eco-sustainable actions are influenced by the mental representation of the environment. Ecological transition requires, above all, a cultural transition capable of acting on ecological paradigms (i.e., the vision of the environment). In the sector literature, ecological competence encompasses not only vocabulary and knowledge (knowing) but also problem-solving (knowing how), environmental thoughts and feelings (knowing how to feel), and eco-sustainable attitudes (knowing how to act and live). The work presents an evidence-based research on the impact of daily shared reading training of eco-narratives for a period of 42 days. **Methodology:** The sample consists of a total of 150 children aged 4 and 5 from 4 sections of kindergarten (2 experimental and 2 control) and 2 Montessori children's houses (1 experimental and 1 control) in two regions: Umbria and Puglia. The quasi-experimental research is based on requesting pre and post reading aloud drawings of nature and the socialization of drawings from children. Drawing data are analyzed using the triangulation method, while the narratives of children through Data Analyst feature of ChatGbt 4.0 are examined, highlighting nodes and categories. **Results:** The outcomes of graphic representations highlight the presence of humans in post-training drawings in the experimental groups, while no significant differences were observed in the control group. In the socialization of drawings in the post-phase, differences are evident between the two methods in the semantic-lexical area, which becomes more specific and precise in the Montessori children's house. There is a greater increase in lexical diversity in

the experimental groups. **Conclusions and Discussions:** The difference between the two methods lies in the proposed bibliography. In the Montessori method, eco-narratives with scientific vocabulary inspired by Montessori cosmic fables were used. It can be asserted that the inclusion of green readings promotes eco-literacy, and the choice of literature determines its impact in terms of quality. This research, albeit small in scale, opens a reflection on the criteria for selecting and constructing bibliographic diversity in children's literature, consistent with Montessori's philosophy of «giving the child the world.» At the same time, it demonstrates how green stories have the power to imagine and reposition the human being in the environment as an integral part of it.

KEYWORDS: eco-literacy; preschool; reading aloud shared; green books; Montessori Method.

RIASSUNTO: Introduzione: L'incipit dell'Agenda 2030 «Noi immaginiamo il mondo...» avvia una riflessione su come l'immaginazione sia una chiave di lettura strategica nell'educazione alla sostenibilità e su come l'agire eco-sostenibile sia influenzato dalla rappresentazione mentale dell'ambiente. La transizione ecologica necessita di una transizione prima di tutto culturale, in grado di agire sui paradigmi ecologici (ovvero sulla visione dell'ambiente). Nella letteratura di settore la competenza ecologica non è solo lessico e conoscenze (sapere), ma anche problem solving (saper fare), pensieri e sentimenti ambientali (saper sentire) e atteggiamenti ecosostenibili (saper agire e vivere). Il lavoro presenta una ricerca evidence based sull'impatto di training quotidiani di letture ad alta voce condivisa di eco-narrazioni per un periodo di 42 giorni. **Metodologia:** Il campione è costituito da un totale di 150 bambini di 4 e 5 anni di 4 sezioni della scuola dell'infanzia (di cui 2 sperimentali e 2 di controllo) e 2 case dei bambini con metodo Montessori (di cui 1 sperimentale e 1 di controllo) di due regioni: Umbria e Puglia. La ricerca quasi sperimentale si basa sulla richiesta ai bambini pre e post training di una rappresentazione grafica della natura e della relativa socializzazione dei disegni. I dati dei disegni sono analizzati con metodo della triangolazione, mentre i corpus delle narrazioni dei bambini attraverso Data Analyst di ChatGbt 4.0, che ne ha evidenziato i nodi e le categorie. **Risultati:** Gli esiti delle rappresentazioni grafiche evidenziano la presenza umana nei disegni post training nei gruppi sperimentali, mentre nel gruppo di controllo non si rilevano differenze. Nella socializzazione dei disegni nell'ex post invece si evidenziano differenze tra i due metodi nell'area semantico-lessicale che nella casa dei bambini diventa più specifica e puntuale. Maggiore invece è l'incremento della ricchezza lessicale nei gruppi sperimentali. **Conclusioni e Discussioni:** La differenza tra i due metodi è la bibliografia proposta. Nel metodo Montessori si sono utilizzate eco-narrazioni con lessico scientifico ispirate alle favole cosmiche montessoriane. E' possibile affermare che l'inserimento di letture green favorisce l'eco-literacy e che la scelta bibliografica ne determina la ricaduta in termini di qualità. Questa ricerca seppur di piccole dimensioni, apre una riflessione sui criteri di selezione e costruzione della bibliovarietà nella letteratura per l'infanzia coerentemente al pensiero Montessori «diamo al bambino il mondo», ma allo stesso tempo dimostra come le storie green abbiano il potere di immaginare e ricollocare l'essere umano nell'ambiente, come parte integrante di esso.

PAROLE CHIAVE: eco-alfabetizzazione; infanzia; lettura ad alta voce condivisa; eco-narrazioni, metodo Montessori.

1. IMAGINING A SUSTAINABLE FUTURE: THE AGENDA 2030 AND THE POWER OF EDUCATION

«We imagine the world...» is an invitation to cultivate imagination as a powerful lever for shaping a sustainable future. The Agenda 2030 stands as a guiding beacon, outlining a path towards a more just, resilient, and harmonious world (UN, 2015). This document is not merely a collection of goals and indicators but a manifesto that opens with the promise of a future we can all contribute to building.

The Agenda 2030, endorsed by nations worldwide, embodies collective commitment to ambitious goals, ranging from reducing inequalities to promoting environmental sustainability. However, at the heart of this commitment lies a potent tool: imagination, where education is the focal point of transformation, capable of shaping enlightened minds ready to tackle global challenges with creativity and awareness (Campos-Fígares & García-Rivera, 2017).

Sustainable education, as emphasized by the Agenda 2030, is not just an act of knowledge transmission but an invitation to explore possible worlds. It is through imagination that we can fuel awareness, shape culture, and stimulate actions that push towards sustainability. In this context, education becomes the catalyst for profound change, guided by the collective vision of a better world (Malavasi & Sandrini, 2022).

Embarking on the path outlined by the Agenda 2030 and also by the GreenComp (Bianchi *et al.*, 2022) requires more than concrete policies and actions; it demands the fervent desire to imagine a future where progress is equitably distributed, and respect for our planet is innate. A future in which future generations inherit not only resources but also the wisdom to preserve them. The Agenda 2030 opens with an invitation to imagine because only through imagination can we forge a world where sustainability is the cornerstone of education and, consequently, our collective destiny.

Imagination emerges as a crucial resource for progress towards sustainable development. It represents a vehicle that enables both individuals and communities to visualize an alternative future characterized by greater sustainability.

Imagination thus becomes a key tool in generating new innovative solutions to environmental problems. In particular, it can be an engine for addressing challenges such as climate change and biodiversity loss, stimulating innovative ideas and approaches (Ott, 2023). Through the ability to visualize new societal models, imagination can contribute to reducing inequalities and promoting social justice (Bell, 2016). Imagination also plays a fundamental role in educating the new generations about sustainability. This involves teaching them to look at the world with a global and intergenerational perspective, promoting awareness of the importance of sustainability in daily choices and future life paths (Caiman & Lundegård, 2018).

The ecological transition, necessary to shape a sustainable future, goes well beyond the mere acquisition of knowledge; it requires a profound cultural transformation that engages with ecological paradigms. According to the existing literature, ecological competence extends beyond mere vocabulary and knowledge of environmental facts (Mirzaeva, 2019). It

embraces the concept of «knowing how,» incorporating problem-solving skills related to the environment. However, it goes further, also involving «knowing feeling,» the ability to connect thoughts and feelings to the surrounding environment (Hurren, 2017; De Carlo, 2023).

Ecological competence, therefore, consists of interconnected layers. In addition to the ability to address environmental challenges through problem-solving, it also includes an emotional dimension. Environmental thoughts and feelings (Keni, 2002) become an integral part of this competence, requiring deep awareness and connection with the natural world. Environmental sensitivity becomes an anchor point to guide daily actions and personal decisions towards a more sustainable lifestyle.

Similarly, ecological competence is expressed through eco-friendly attitudes, translating knowledge into concrete actions. The shift from «knowing how» to «knowing how to act and live» implies a cultural change that reflects a profound awareness of the interconnections between humans and the environment (Ahn *et al.*, 2018). The adoption of environmental themes behaviors is no longer just an option but becomes an imperative to contribute to the ecological transition.

Promoting an integrated and deep culture of sustainability requires the construction of ecological competence that embraces not only knowing but also feeling and acting. In this context, the role of eco-narratives or environmentally-themed stories emerges as crucial. Through these narrative tools, it is possible to shape the perception of the environment, engaging not only the rational mind but also emotions and attitudes. Eco-narratives become powerful vehicles for conveying scientific knowledge, eliciting empathy towards the natural world, and inspiring sustainable actions (Capra, 2013).

In the perspective of comprehensive ecological competence, culture plays a central role, serving as fertile ground for the embedding of sustainability values. Environmental-themed stories, within this cultural context, contribute to transforming our perception of the environment from a separate entity to an integral part of our daily existence. This cultural transition becomes the foundation upon which to build a future where sustainability is not merely a goal to achieve but an intrinsic and natural component of our way of life (Zimmerman, 2016).

The present study constitutes a detailed and evidence-based investigation into the effect of daily shared reading sessions (Bartolucci & Batini, 2020; Batini, De Carlo & Toti, 2022) of eco-narratives. Over a significant period of 42 days, the research aims to explore the influence of this specific practice on the learning experience and perceptions of preschool children.

The act of reading aloud, inherently powerful in its educational impact, merges in this context with the perspective of eco-narratives (De Carlo & Pugacheva, 2021), creating an immersive literary experience that not only focuses on knowledge transmission but also extends to the promotion of environmental awareness and a deeper connection with nature (Corraliza *et al.*, 2019).

Through the rigorous protocol of reading aloud texts with environmental themes, the research aims to examine how this practice impacts the world perception, environmental understanding, and cognitive growth of the involved children (Oliveira *et al.*, 2015). The centrality of eco-narratives in shared reading suggests an innovative perspective, as the learning

process goes beyond mere information transmission, propagating through the sensory and emotional experience of stories (Allain & Lemieux, 2006).

Through an evidence-based approach, this study aims to contribute to the growing body of knowledge in the field of environmental education, revealing the potential positive repercussions of an educational intervention based on shared reading of eco-themed stories. In the future, an extended research timeframe is hypothesized to capture not only immediate effects but also potential long-term transformations that may arise from daily immersion in eco-narratives through shared readings.

For now, this research presents itself as a thorough and systematic investigation into the impact that the combination of shared readings and eco-narratives can have on the cognitive growth and environmental perception of children (Nurwaqidah *et al.*, 2020).

2. RESEARCH METHODOLOGY: EXPLORING THE IMPACT OF ECO-NARRATIVES TRAINING THROUGH SHARED READ-ALOUDS INIZIO MODULO FINE MODULO

The study engages in a rigorous methodology, aiming to unveil the effects of systematic and daily exposure to stories through eco-narrative read-alouds by a teacher to a diverse sample of children aged between 4 and 5 years old. The sample composition includes 4 sections of kindergarten and 2 Montessori children's houses, distributed across two Italian regions, Umbria and Puglia.

The choice of a quasi-experimental approach allowed for the comparison of two distinct groups: those exposed to the experimental treatment, namely the read-aloud of green books (experimental group), and those following traditional teaching methods (control group). In each region, 2 kindergarten sections and 1 Montessori children's house were selected for each group, ensuring a diverse representation of educational contexts. In total, the sample consisted of 150 children aged between 4 and 5 years old.

The research question was as follows: Can experiences of listening to eco-themed stories influence the ecological paradigms of children? And if so, which types of stories are most effective?

The experimental groups, after a teacher training period on the read-aloud method consisting of 4 sessions and co-construction of green book bibliographies, began reading aloud for a period of 42 days (approximately 20 minutes per day). The stories were chosen based on the criteria of progressiveness and bibliovariety (Batini *et al.*, 2019).

Data collection involved requesting children to create drawings of nature and the related socialization of drawings before and after the period of exposure to eco-narrative read-alouds. This approach aimed to visually capture the evolution of their perceptions and environmental concepts during the intervention. Barraza in 1999 had already conducted research in English and Mexican schools analyzing drawings of school-aged children (7 to 9 years old) to assess their environmental perceptions and main expectations and concerns for the future. Children's drawings have proven to be useful tools in providing valuable information for

assessing children's environmental perceptions. More common but always interesting is the use of drawing to capture children's moods (Brechet *et al.*, 2022).

Analyses of children's drawings followed a triangulation method, allowing for an objective evaluation of results by exploiting analogies and differences.

Simultaneously, to explore the children's narratives derived from the socialization of their drawings, Data Analyst feature of ChatGbt 4.0, an advanced language model, was used. This method, providing incremental prompts, allowed for results more aligned with specific expectations and identified key nodes and categories within the children's discourse, offering a detailed analysis of their reflections and perceptions related to eco-narratives.

Through this methodology, the impact of immersive exposure to eco-narratives could be captured, going beyond mere data collection and approaching the unique perspectives of the children involved in the research.

3. EMERGING RESULTS FROM THE RESEARCH: IN-DEPTH INSIGHTS INTO GRAPHIC REPRESENTATIONS AND SOCIALIZATION OF DRAWINGS

The analysis of graphic representations, inspired by the authentic assessment approach in drawing assessment (Smith, 2009; Smith *et al.*, 2018), provides an in-depth look at changes in children's perceptions after a 42-day exposure to eco-narratives. In the experimental group, exposed to eco-narrative read-alouds, clear traces of human interaction emerged, while in the control group, following a traditional teaching routine, no significant variations were observed. Below are some of the children's drawings pre- and post-intervention in both the control and experimental groups, both in the common setting (Figs. 1-2) and in the Montessori setting (Figs. 3-4).

Fig. 1. Results of the drawings in the experimental groups (Common Curriculum)¹



(ex ante) (ex post)

Source: Own elaboration - experimental groups.

¹ For these drawings related to the experimentation with the common method, we thank Micol Migliorati, who conducted the field experiment with the children, partly as part of her thesis. For the sections with the Montessori Method, we thank Teacher Donatella Bruno.

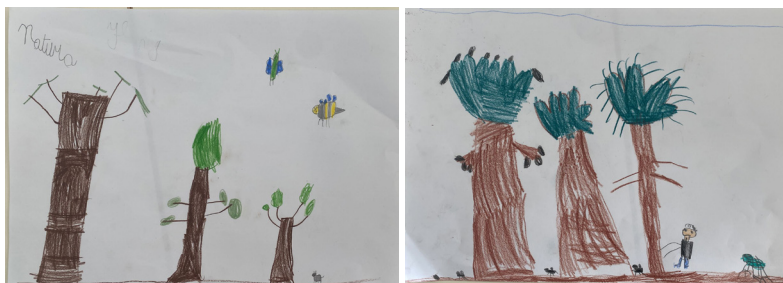
Fig. 2. Results of the drawings in the control groups (Common Curriculum)



(ex ante) (ex post)

Source: Own elaboration - experimental groups.

Fig. 3. Results of the drawings in the experimental groups (Montessori Curriculum)



(ex ante) (ex post)

Source: Own elaboration - experimental groups.

Fig. 4. Results of the drawings in the control groups (Montessori Curriculum)

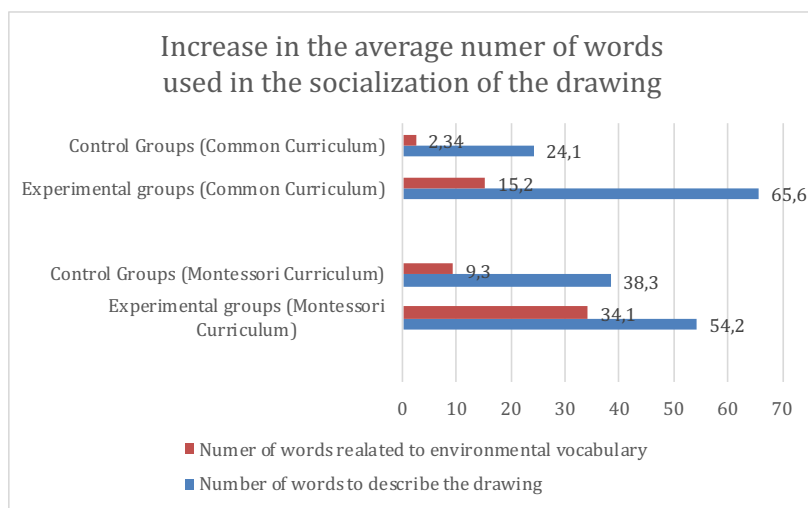


(ex ante) (ex post)

Source: Own elaboration - experimental groups.

A distinctive point was observed in the socialization phase of the drawings during the post-training. Here, the differences between the two methods become more evident with children attending the Montessori children's house, where a more pronounced specificity and precision are highlighted in the semantic-lexical area. This detailed analysis is supported by the triangulation methodology, which combines quantitative and qualitative data (Denzin & Lincoln, 2018), providing a more comprehensive understanding of the emerging dynamics in children's drawings.

Fig. 5. Results in the socialization of the drawings



Source: Own elaboration.

As observed in Graph 1, it was possible to quantify from the dataset both the number of words used by the children to describe their drawings and the specific vocabulary used in the environmental semantic area.

Particularly interesting was the noticeable increase in lexical richness found in the experimental groups, with significant significance in the Montessori setting, where an increase in specific ecological vocabulary was observed. This demonstrates a positive impact of eco-narratives on the diversification of vocabulary used by children.

Overall, these results suggest that the introduction of daily ecological narratives not only influences the perception of human presence in nature but also the variety and depth of language used by the participants.

The in-depth analysis of the results highlights tangible changes in the graphical representation and lexical approach of the children, emphasizing the effectiveness of the shared read-aloud intervention of eco-narratives and the interesting specificity of the Montessori practice in the field of ecological education.

4. CONCLUSIONS AND IMPLICATIONS OF THE RESEARCH ON THE IMPACT OF ECO-NARRATIVES

The conducted research has shed light on significant differences between the traditional approach to environmental education and one that involves the use of eco-narrative read-alouds. Additionally, it measured the effects of introducing eco-narratives within the Montessori education context, highlighting the influence of the proposed bibliography variable. The key difference between the two methods lies in the selection of stories presented to children. In the Montessori method (Montessori & Livingston, 1917), eco-narratives with a scientific vocabulary inspired by the scientist's cosmic education (Raimondo, 2018) were utilized. In Montessori's cosmic fables, considerable attention is given to scientific vocabulary. The stories can incorporate scientific terms and concepts in a way accessible to children, thereby contributing to the development of their vocabulary and understanding of the surrounding world. Montessori believed in the importance of providing children with a scientific vocabulary, a valuable tool for laying a solid foundation of scientific knowledge from early childhood and aiding in cognitive development and understanding of the world (Bednarczuk, 2021). Montessori's cosmic education aims to present a comprehensive view of the universe, incorporating themes related to astronomy, geography, biology, and natural sciences. The use of scientific vocabulary is an integral part of this process, helping children explore and understand natural phenomena and scientific laws.

It can be affirmed that the inclusion of green readings promotes eco-literacy, and the bibliographic choice determines its impact in terms of quality. In the Montessori method, the use of eco-narratives incorporating scientific terminology, inspired by Montessori's cosmic fables and adhering to truth, has facilitated the enhancement of eco-literacy vocabulary development among children (Montessori, 2012). The conscious choice of bibliography emerges as a key factor, directly influencing the quality of read-aloud experiences. The adoption of green stories, consistently with the Montessori principle of «giving the child the world,» not only contributes to imagination and understanding of humans as an integral part of the environment but also to the construction of ecological awareness (Misheva, 2020).

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