DEMETER

Developing Interdisciplinary Methodologies In Education Through Enhanced Relationships Between Schools And Farms

Co-funded by the Erasmus+ Programme of the European Union

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Interdisciplinary Methodology

Vänersborgs kommun

Hushållnings sällskapet

Washingborough Academy · Values for Success

Università degli Studi di Milano Bicocca

SERN

Soil Association

Colégio do Sardão

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Objectives

The project stems from the aim of supporting teachers and farmers in adopting innovative and collaborative practices between schools and farms, to be developed in an interdisciplinary way, in order to define disciplinary and transversal learning objectives and link them with educational activities on farms. The international comparison, the dialogue between teachers, researchers, farmers and institutions, the training provided within the project also represented an opportunity for professional development, in the perspective of lifelong learning, for all the actors involved.

Activities

Literature review

The first output of the project was a literature review in order to investigate how previous research has approached the relationship between primary schools and farms from different perspectives such as educational partnership, teaching strategies adopted and learning outcomes promoted.

Collecting and analysing good practices

The first activity foreseen by the project was the collection of good practices representing examples of fruitful collaboration between schools and farms. They were then shared and analysed by the project team.

Testing (2 phases)

Each partner tested the practices of the other partners, in their own schools, to assess how they could be adapted to specific contexts. The results of this phase made it possible to implement the practices and test them in a second phase of experimentation involving teachers from outside the partnership.

Training

The training, offered at the end of the first experimentation phase, was aimed at illustrating the activities carried out, the results of the research and the development of the interdisciplinary methodology. The training focused in particular on explaining how to implement teaching practices, how to link them to the learning objectives of the various national curricula and how to organise learning activities and contexts.

Verifying the effectiveness of the implemented practices

Indicators and their levels have been defined to monitor the practices in progress, used by the experimenting teachers to identify the level reached and motivate them by highlighting strengths and weaknesses.

Toolkit development

The toolkit is intended as an easy tool for teachers and educators to design interdisciplinary school-to-farm learning paths linked to the transversal goals of the 2030 Agenda and to disciplinary learning objectives.

Structuring the Literature Review

The first output of the DEMETER project is the current literature review, which was conducted between September 2018 and March 2019 by the Milano Bicocca University Research Unit[1], in order to investigate how previous research have addressed the relationship between primary schools and farms from different perspectives such as educational partnership, teaching strategies adopted and learning outcomes promoted.

The teaching-learning methodologies specifically targeted for implementation in DEMETER are pedagogically grounded in the Reggio Emilia approach (Gandini, 1998; Ceppi & Zini, 2011), which assumes the environment as a "third educator" with the power to convey and catalyse the educational messages underlying school planning and expects learning to be enhanced by student observation and inquiry.

The purpose of the literature review was to theoretically underpin the rationale for the DEMETER project by identifying effective teaching and learning methodologies for the development of key competencies in primary school children through farm-based education, as a specific approach to outdoor education.

Several areas of research focused on the learning outcomes promoted in the various approaches of outdoor education, both academic and transversal skills, and most of them show a positive impact on both (Williams & Dixon, 2013). Also, regarding the outcomes emerged the need to implement the research to better measure and understand the effects.

Another topic are the teaching methods, indicated as few addressed by research in biology education and environmental education including outdoor education (Jeronen et al., 2017), this also to a lack of teachers' confidence with the outdoor settings that can be reduced by promoting teacher training in this field (Blair, 2009; Dillon et al., 2003).

We built up our search by entering a selection of keywords and combinations of keywords into multiple online search engines and databases including Google Scholar, SpringerLink and Elsevier.

Keywords combinations	Google Scholar	Springer Link *	Elsevier
"Farm + School"	8300	481	270
"Farm + Learning Outcomes"	4	204	520
"Farm + Teaching"	346	237	18
"Farm + school + children"	96	390	3

* Discipline: Education; subdiscipline: Learning and Instruction

Table 1. Outcomes of scoping

1 In collaboration with two teacher-researchers: Doris Valente and Chiara Gianotti.

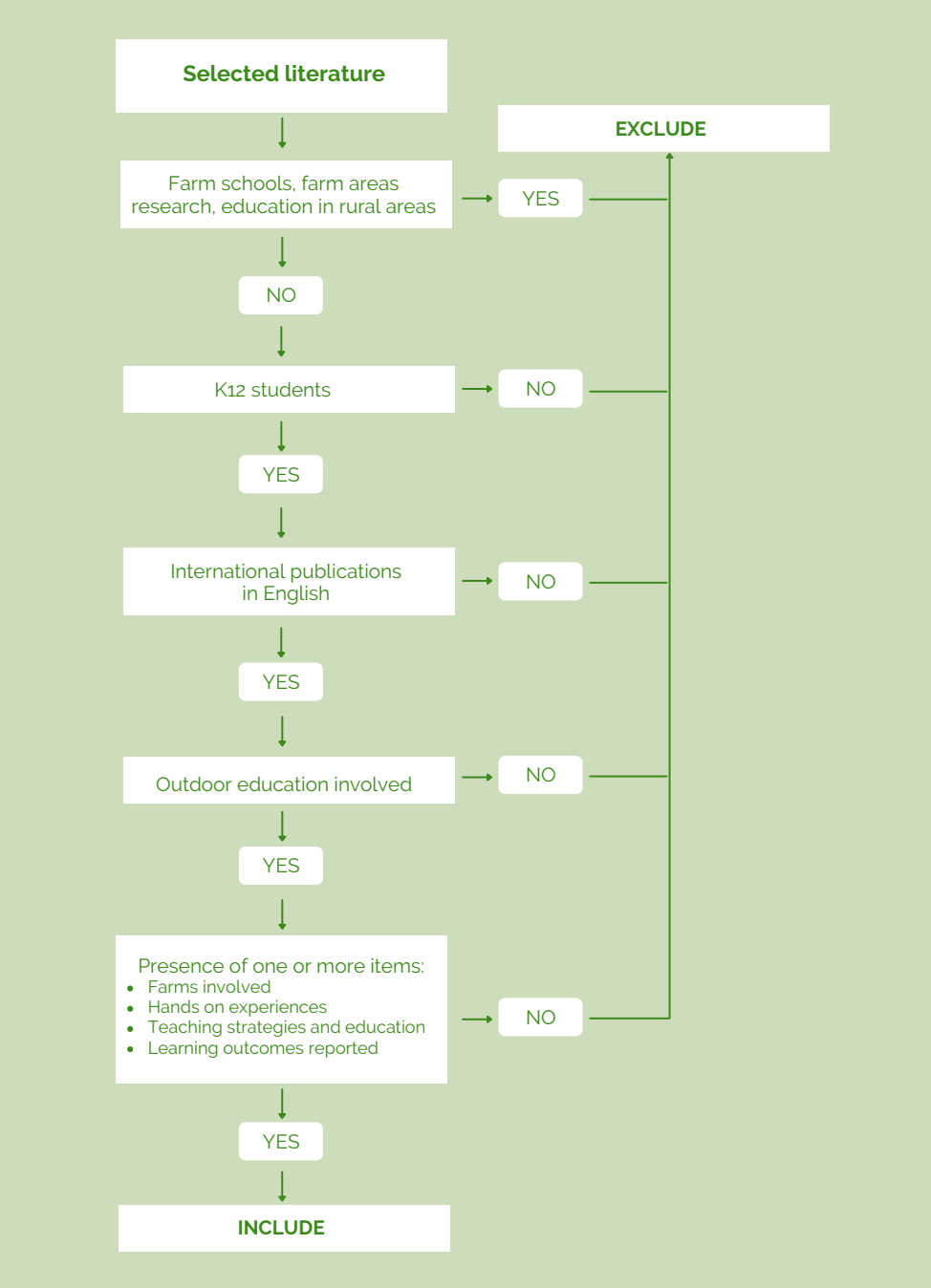

Figure 1. Tree summarizing inclusion/exclusion criteria

The huge number of results (table 1) was drastically reduced by excluding literature, based on the paper titles alone, all publications dealing with agricultural schools and institutes, universities, preschool and higher education, and following the criteria illustrated in Figure 1.
This overview led us to divide the remaining 121 papers – based on the abstracts – into three main categories, even with multiple overlapping themes.[2]

- school-farm partnership (18)
- learning outcomes (55)
- teaching strategies (48).

[2]We used Mendeley library, a web tool for creating shared archives, to organize the research papers identified via these searches and make them accessible to the entire research team.

NUMBER OF PAPERS RELATED TO CATHEGORIES

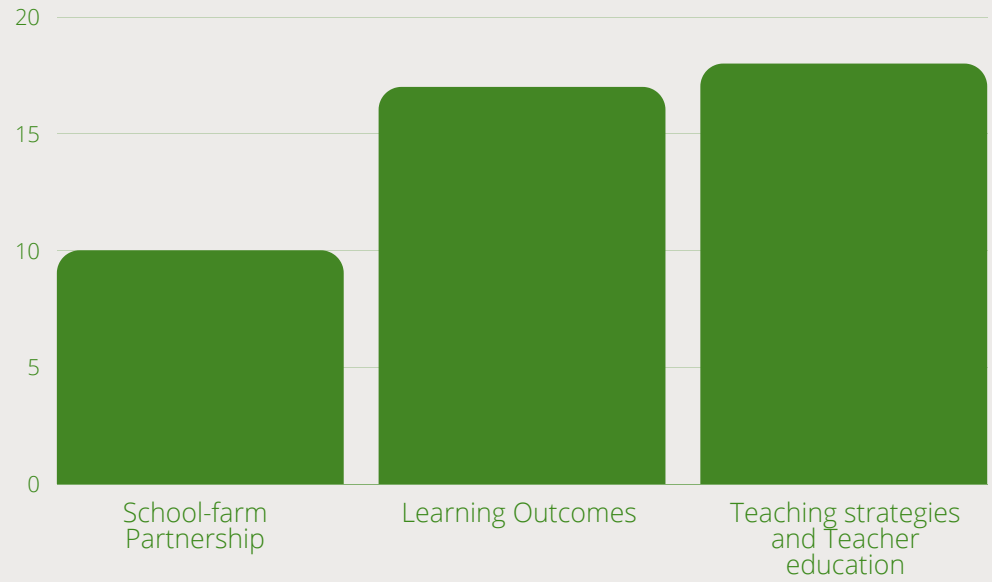

Figure 2. Breakdown of the reviewed papers by key category.

COUNTRY OF ORIGIN

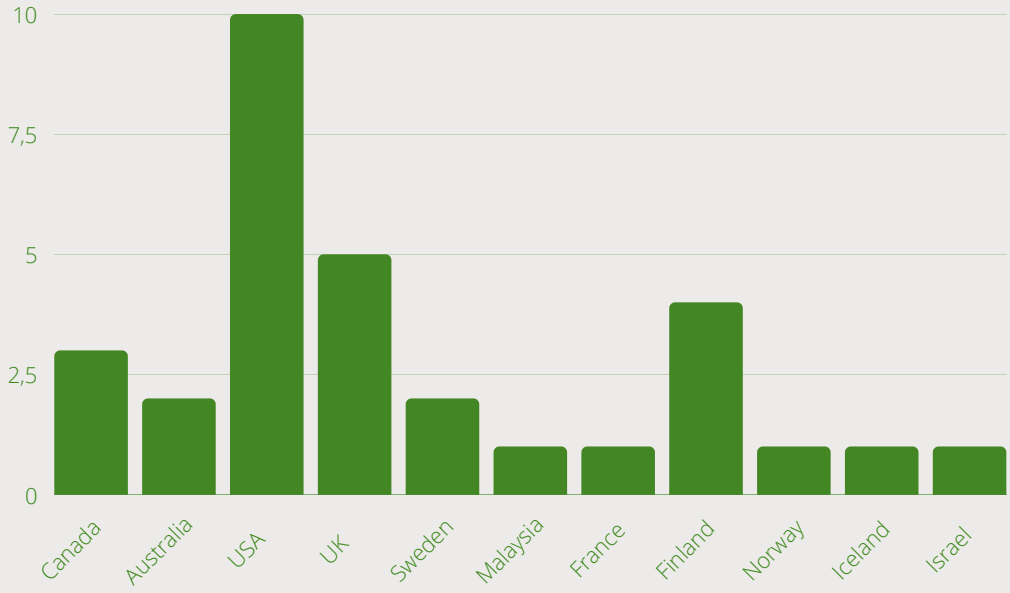

Figure 3 Breakdown of the reviewed papers by country where the research was undertaken

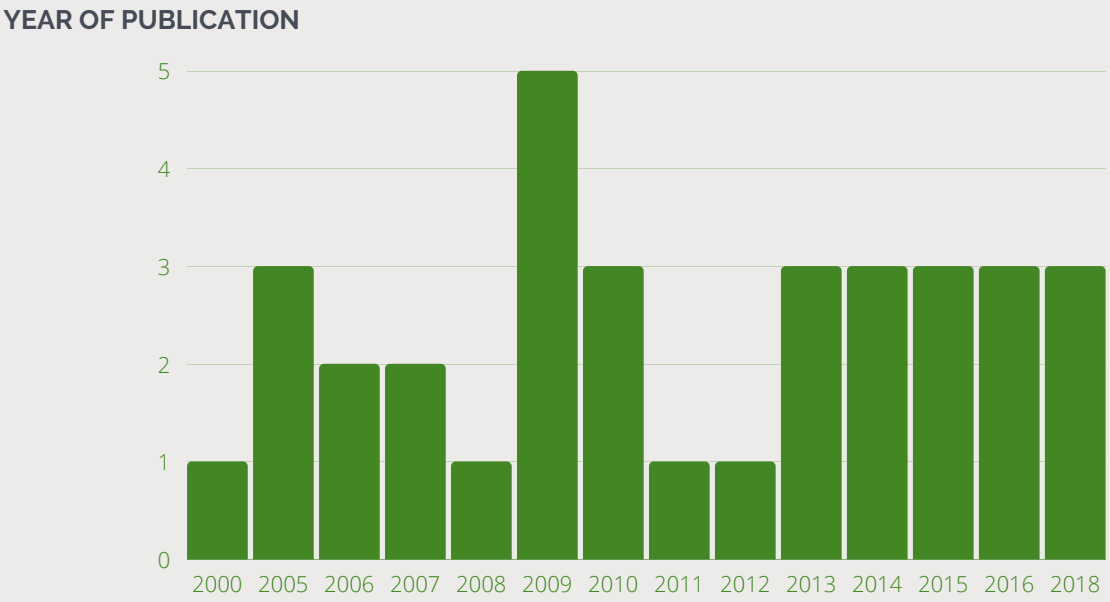

Figure 4. Breakdown of the reviewed papers by year of publication

The pedagogical role of the farm

The topic of the farm as a learning environment is rooted in the field of outdoor education and opens up various connections with education for sustainable development, nutrition, good health and wellbeing education. As noted in the goals outlined in the Global Sustainable Development Report 2019[3](Agenda 2030), Education for Sustainable Development (henceforth ESD) and outdoor education need to be enhanced by strengthening the co-operation among schools, local area partners, and civil society in order to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (SDG 4).[4]

Following this view, the school-farm co-operation can be based on several guiding principles like locality, continuity and active participation (Risku-Norja & Korpela, 2010).

As educational agencies embedded in natural and anthropized settings (Torquati & Ernst, 2013), schools play an active part in their broader environment; hence, when a working alliance is formed among all the actors in a local area, especially via ad hoc networks such as ENSI and GEEP[5], this enhances teachers' professional development, fostering innovative teaching practices in the field of ESD (Smith, 2018, p. 282).

Numerous studies show that outdoor education settings and the opportunity to interact with the environment via natural materials can facilitate more complex learning in children: such approaches create a continuum with the external environment, of which young learners may have little prior experience, especially in heavily urbanized contexts (Scott et al., 2012; Fägerstam & Blom, 2013; Selmer et al., 2014).

Educational experiences in outdoor settings and engagement with outdoor environments have proved to have a positive impact on psychological and physical wellbeing (Grey et al. 2015; Roberts et al., 2019) and to yield enhanced learning outcomes in students both when the setting is highly structured and when it is more loosely structured (Dhanapal et al., 2013; O'Brien & Murray, 2007).

[3]Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development (United Nations, New York, 2019).

[4]https://sdgs.un.org/goals/goal4

[5]https://www.ensi.org
https://thegeep.org/

However, as observed by 'Skamp and Bergmann' (2001), teachers are little inclined to deliver learning experiences that include or are based on the natural environment, with the result that they forgo both meaningful learning opportunities for their students and the opportunity to design educational offerings with other local actors.

Building a Farm-School Partnership

Substantially research on this theme has been conducted within the framework of the Norwegian movement The Farm as a Pedagogical Resource, founded in 2002 (Jolly & Krogh, 2010; Krogh & Jolly, 2011). In their work, Linda Jolly and her research group describe the core principles informing the design of courses that initially saw farms and schools working together to jointly implement the pioneering "Living School" project.
This body of work, combined with practical online tools[6] and grey literature (Harris, 2009), enabled us to identify a set of key actions that must be undertaken for the farm-school partnership to flourish. Specifically, these literature sources suggest the importance of:
- offering joint training to teachers and farmers,
- ensuring that any program of educational activities is co-designed by farmers and teachers,
- developing a shared vision and mediating between the farmers' and teachers' needs.

The need to establish a two-way dialogue between the outdoor learning setting (farm) and the school forced teachers out of their comfort zone and also fostered mutual learning by researchers and local actors (farmers), helping them to acquire a more in-depth understanding of the situation in which the educational action takes place (Hazard et al., 2018).
The need to design professional development programmes to equip teachers to facilitate learning in natural environments is also underlined in an Australian farm-school program (Ballantyne & Packer, 2009). This program also shows the key role that having access to dedicated centres, such as Queensland's Outdoor and Environmental Education Centres, could play in building the partnership by giving it an institutional support.
The importance of an institutional umbrella emerges also from the US Farm-to-School project, which has been focused more narrowly on food education, which is aligned with federal and state legislation such as No Child Left Behind, and has been documented as enhancing children's agri-food knowledge, nutritional awareness, and behaviours (Joshi et al., 2008).

A second topic in shaping the characteristics of an effective partnership is the need of a farm-school co-design of the activities, that presumes a mutual recognition of skills and knowledge and as states the already mentioned research carried on by Linda Jolly that encouraged "close contact" between farmers and teachers so that the activities on the farm could become a part of the regular curriculum (Jolly et al., 2004, p. 3). The flip side of this closeness could be that farmers, with long-term links with a particular school sometimes, felt that it was based on personal relationships with a specific teacher and if that teacher moved on, the link with the school often collapsed (Jolly & Krogh, 2010).
If there are also logistic difficulties to consider, as co-design takes a long time, however, the Risku-Norja and Korpela (2010) research highlighted that the teachers reported that it was worth it for the opportunity to offer children experiences in continuity with the curriculum in a new authentic learning environment, and the farmers for the development of an effective way of dealing with the public resulting from cooperation with the schools.

[6] www.visitmyfarm.org
https://leafuk.org/farmertime/resources
https://www.foodforlife.org.uk/schools/what-can-you-do/visit-a-farm

Another key issue implicated in the farm-school co-design, is the pedagogical role of the farmer who has to also deal with the children's and teacher's representations of farmers and farm life, which were often stereotypical. Similarly, we have also noticed recurrent prejudices, in several educational programs conducted in Italian farms (Nigris et al., 2014), such as the idea that all farmers are male, wear straw hats, and do not avail of modern technologies.
From the Norwegian studies it also emerged that the greater effectiveness of projects is guaranteed by a continuity in the relationship; the results of the three cases analyzed show that a project in which contact with the farmer is direct and well-integrated into the curriculum is more effective for the students (Jolly & Krogh, 2010).
Encouraging regular farm visits during which children enjoy the opportunity to directly participate in everyday farm tasks could also "breaks down social barriers to age segregation and provides opportunities for children and adults to meet and talk about real life issues and life experiences" (Mayer-Smith et al., 2009, p.119).

t is worth mentioning that, although it is not part of the scientific literature, the project Visit my Farm has[7] produced a list of detailed guidelines for making farm learning experiences meaningful. These recommendations include:

- choosing a farm park vs an "authentic" farm as appropriate (the author suggests the former for younger children or those with special needs),
- the visit should be led by the farmer,
- teachers should visit a farm during their initial Teacher Education or, at least, before planning a class project.
- there is a need to raise awareness, among teachers and farmers, of the organizations that can help them to plan farm visits,
- intermediary organizations should support existing farmer networks and inform farmers about the requirements for hosting school visits.

INSTITUTIONAL UMBRELLA	TRAINING	CO-DESIGN	SOCIAL AND ECONOMIC SPILLOVER	OBSTACLES
Queensland's Outdoor and Environmental Education Centres (Ballantyne & Packer, 2009)	"The Farm as a Pedagogical Resource" course led by Norwegian University of Life Sciences. One year course for teachers and farmers (Krogh et al., 2011)	Activities carried out both at school and on the farm (Ballantyne & Packer, 2009; Krogh & Jolly, 2011; Mayer-Smith et al., 2009; Risku-Norja & Korpela, 2010; Selmer et al. 2014; Smeds et al. 2015)	Local products in school meals, farms hosting community events (Botkins & Roe, 2008)	Stereotypical representations of farm life (Mayer-Smith et al. 2009, Nigris et al, 2014, Risku-Norja & Korpela, 2010)
National pioneer project "Living School" (Krogh & Jolly, 2011)	A training day at the farm recommended (Harris, 2009)	Interaction with the farmer prepared beforehand at school (Jolly & Krogh, 2010)	Steady market for local producers (Allen & Guthman, 2006)	Farmers refers difficulty in finding schools cooperation (Harris, 2009)
National FTS Network (Botkins & Roe, 200)	Need of design professional development programmes (Ballantyne & Packer, 2009)	Two-way dialogue (Hazard et al., 2018)	Opportunity for farmers to develop public relationship (Risku-Norja & Korpela, 2010)	Move out from teaching comfort zone (Hazard et al., 2018)
	Pedagogical enforcement of the farmer's role (Risku-Norja & Korpela, 2010)	Link with the curriculum (Jolly, 2004; Risku-Norja & Korpela, 2010; Selmer et al. 2014)	Parents involvement (Selmer et al. 2014)	Co-design takes a long time (Risku-Norja & Korpela, 2010)
	Fostered mutual learning (Hazard et al., 2018)	Specific co-designed and evaluated project required (Krogh & Jolly, 2011)	Intergenerational dialogue (Mayer-Smith et al. 2009)	Fund & seasonality (Botkins & Roe, 2008)

Figure 5 Summary table of the main issues involved in building the school-farm partnership

[7] https://www.visitmyfarm.org/preparing-for-your-farm-visit#guide-resources

Learning Outcomes

Learning outcomes can be divided into two sub-themes: more purely academic outcomes, in terms of subject-specific learning, and broader outcomes such as transversal skills, attitudes, and behaviours.
Two previous literature reviews have addressed this theme, among others, offering us a valuable initial guide to the key issues surrounding the impact on student learning outcomes of outdoor and non-formal learning settings such as farms.
The more recent of these two reviews, conducted by Williams and Dixon (2013) at Portland State University, examined the 'Impact of Garden-Based Learning on Academic Outcomes in Schools: Synthesis of Research Between 1990 and 2010' and pointed out key gaps in the existing research and the fact that studies up to that point had rarely succeeded in identifying what aspects of a particular programme had helped to yield positive impacts. The authors concluded that investment in outdoor education had not been accompanied by a "parallel focus on rigorous research to understand the academic learning outcomes in a systematic manner" (ibid, p. 226). Nevertheless, they also pointed out "a preponderance of positive academic outcomes especially in science, maths, and language arts, giving credence to gardens serving as instructional and curricular means for covering academic content" (ibidem).
A detailed analysis and assessment of the learning outcomes has been carried out by Finnish researchers (Smeds et al., 2015b) examining the role of the farm as learning environments in light of the drastic decrease in the number of active farms in Finland. The test results indicated that, at the five-month follow-up stage, low academic performers who had been exposed to the authentic learning environment of the farm obtained higher mean test results than did high academic achievers who had received their intervention in the classroom setting only. This finding bears out not only the effectiveness of on-farm activity but also its significant potential to boost inclusivity.
These outcomes are in keeping with a broader framework that defines educationally effective programmes as those that do not lay a strong emphasis on the products of learning, but rather stimulate processes of inquiry, generate open-ended questions, and generally foster active participation and engagement by the students. The wide-ranging cognitive, affective, physical, and behavioural impacts of outdoor educational experience are well illustrated in several studies like the Forest School project by O'Brien and Murray (2007).
The positive impact of outdoor activities on students' soft skills include attitudinal behavioural chances (Ballantyne & Packer, 2009; Blair, 2009), problem solving and peer cooperation (Fägerstam, 2014; Kangas et al., 2017), motivation, concentration and confidence (O'Brian & Murray, 2007) and self assessment skills (Nuutinen, 2018).
Within Nuutinen empirical study, 'The Encounters Project in Finland', children used the KLW grid (what they already Knew, what they had Learnt and what they Want to know further) to self-assess their learning. The same grid was used in the Demeter practices.
Two PhD theses have also offered in-depth investigations of outdoor learning outcomes: the work of Pia Smeds (2017) and 'Farm Visit: Interdisciplinary outdoor learning for Primary School Pupils and Scotland's Curriculum for Excellence' (McIver Mattu, 2016). The latter explored the use of educational farm visits as an example of outdoor learning, in the[8] context of the Scottish Curriculum for Excellence through Outdoor Learning (Scottish Government, 2010). The author's starting assumption was that the new curriculum is lacking, insofar as it offers no evidence of broader connections between outdoor learning formats and curricular contents.

[8] https://education.gov.scot/Documents/cfe-through-outdoor-learning.pdf

McIver Mattu observed that the teachers in her case study were able to link their farm visits to a wide range of curricular areas, such as Art, Music, Drama, Numeracy and Science, and pointed out that the children experiences at the farm, like touching, feeding, and seeing animals, produce long-lasting and emotionally charged knowledge (McIver Mattu, 2016, p. 150)

SCIENCE	MATH	OTHER SCHOOL SUBJECT	SOFT SKILLS AND ATTITUDE	NUTRITIONAL KNOWLEDGE AND BEHAVIOURS	LONG-TERM IMPACT
Effectiveness of outdoor context in science scores (Fägerstam & Blom, 2013; Smeds et al., 2015; McIver Mattu, 2016)	Higher math scores for students who followed traditional learning programme (Pigg et al., 2006)	Art, music, drama (McIver Mattu, 2016)	Problem solving and peer collaboration (Fägerstam, 2014, Fägerstam & Blom, 2013; Kangas et al., 2017, Murray & O 'Brien, 2005)	Fruit and vegetables consumption increased among those with the lowest intakes (Bontrager Yoder et al., 2014)	Long term persistance of concepts and process (Smeds, et al., 2015b)
Effectiveness of garden based curriculum in science scores (Klemmer et al., 2005)	Long-term better results in math tests for students engaged in outdoor activities (Fägerstam & Blom, 2013)	Literacy: outdoor exploration activities enhanced children's writing ability (Scott et al, 2012)	Confidence, social skills, language and communication, motivation and concentration, knowledge and understanding (O'Brien & Murray, 2007)	Fruit and vegetables consumption increased (Kropp, 2018)	Long-lasting and emotionally charged knowledge (McIver Mattu, 2016)
The potential for indoor and outdoor learning to complement each other (Dhanapal & Lim, 2013)	Numeracy (McIver Mattu, 2016)	Language improvement (Murray & O 'Brien, 2005)	Attitudinal and behavioural changes related to environment (Ballantyne & Packer, 2009, Blair, 2010; Murray & O'Brien, 2005)	Awareness of the food (milk) chain (Smeds et al., 2015b)	Higher degree of long-term knowledge retention (Fägerstam & Blom, 2013)
			Self-assessment skills (Nuutinen, 2018)	Higher veg intakes with long-term effect (Kropp, 2018)	

Figure 6 Summary table of the main Learning Outcomes

Teaching strategies and teachers' competences

Several studies have identified teacher-reported obstacles to conducting farm/outdoor learning activities. One issue raised by multiple authors, that we have already addressed in the school-farm partnership paragraph, is that effective farm-school educational projects require ad hoc training for teachers, who perceive themselves as poorly informed about farming topics and are not confident in their ability to teach them well (Bowker, 2002; Knobloch et al., 2007; Tal & Morag, 2009). A key to the effectiveness of training is the teachers "openness to find value in training related to field-based teaching and individual's predisposition to being out of doors" (Scott et al., 2015, p. 177).

A recently published report on the Erasmus Plus project, A Rounder Sense of Purpose (Vare et al., 2019), offered a practical accreditation model for ESD educators, suggesting that they require 12 competences, each of which breaks down into three learning outcomes with multiple underlying components.

The four rows of the RSP competence table suggest a process that the educator might follow:
(a) integration–using knowledge from different dimensions, looking at interconnections and cause-effect relationships
(b) involvement—building this understanding into their personal sense of commitment
(c) practice—combining the two stages above in their practical work as an educator
(d) reflection—evaluating the process and results of their work, assuming responsibility, and taking decisions before repeating the process in an iterative learning loop. (ibid. p. 9)

Lack of time is a frequently reported obstacle (Harris, 2009). Already emerged in the process of partnership building: teachers have little time to engage in additional planning, whether at school or on-site at the farm and also may fail to initiate collaboration with farmers due to a lack of awareness about the presence and activity of local environmental organizations (Marcombe, 2013). In addition, the number of months during which it is feasible to spend time outdoors is limited by seasonal weather patterns (Trexler et al., 2000).

Cooperation with an expert may also help teachers to overcome concerns about threats to child safety: in one study on student teachers' perceptions of outdoor learning settings (Torquati & Ernst, 2013), the main reason that certain sites were viewed as less suitable for educational activities were safety hazards, which typically require the presence of additional adults in order to guide and supervise the children.

Basic and in-service teacher training can thus play a crucial role (Smeds et al., 2015b) in helping teachers to develop key competences needed to offer children learning experiences in natural settings: teachers require technical knowledge about how to provide appropriate supervision, but also the capacity to design structured and unstructured learning experiences in natural setting. In the same way, teachers' prior knowledge and hands-on experience in outdoor learning are influenced by, and include, their preconceptions and representations of education in natural settings, benefits (Anderson et al., 2006), potentially setting off a virtuous cycle of educational offerings, combining outdoor and indoor experiences (Norðdahl & Jóhannesson, 2016).

Other studies confirm that teaching confidence in promoting this holistic perspective and experience-based strategies are increased by training (Anderson et al. 2006, Zhai. 2012).

As observed by Angelotti et al., stimulating future teachers to get involved in and reflect on their process of knowledge acquisition has further value because it provides them with an educational model that they can reproduce in schools. It is of great value for teachers to have a systemic overview of the connection between food products and primary sources and the ability to guide their students to acquire this concept.

Furthermore, when teachers have training opportunities or a personal interest in farming/nature, they are more inclined to invite questions, both open and focused, from their students and to help the children to develop more complex answers (Bowker, 2002). Nevertheless, research shows that teachers' interest in, and knowledge about, farming and nature is not enough to produce an effective learning environment, just as visits to outdoor settings do not guarantee, by themselves, that learning will take place (Smeds et al., 2015a).

The literature furnishes some guidelines for teachers on how to make their outdoor/school education programs effective. The most successful outdoor learning projects are those in which learning products are not heavily emphasized, inductive teaching methods are used, an inquiring approach is stimulated (Bowker, 2002), open-ended questions are generated, and students actively participate and appear involved (Ballantyne & Packer, 2009, Jeronen et al., 2017; Kangas et. al 2017; Zhai, 2012). Inquiry-based learning is encouraged in the first hand by taking into account childrens prior knowledge (Zhai, 2012), irrational conceptions (Smeds et al., 2015b) and misconceptions (Bowker, 2002).

TEACHING METHODOLOGIES	TEACHERS' TRAINING	TEACHERS' COMPETENCES and ATTITUDES	CURRICULAR LINKS	CONCERNS AND BARRIERS
Inquiry based learning (Bowker, 2002)	Agricultural training for teachers is recommended (Knobloch et al. 2007)	Teachers' preconceptions and beliefs influence the success of outdoor learning experiences (Harris, 2009; Knobloch et al., 2007)	TEKS objectives and School gardening curriculum content (Klemmer at al., 2005)	Teachers perceive themselves as poorly informed about farming topics/environmental issues (Bowker, 2002; Knobloch et al., 2007; Marcombe, 2013; Tal & Morag, 2009)
Experience based learning (Ballantyne & Packer, 2009; Zhai, 2012)	Teaching confidence, holistic and experienced strategies increased by training (Anderson et al., 2006; Angelotti et al., 2009; Blair, 2010)	Teachers prior knowledge influences preconception of outdoor learning benefits (Anderson et al., 2006)	Cooperation with agricultural/environmental experts facilitate the integration of outdoor learning activities with the school curriculum (Affolter & Varga, 2018; Trexler et al., 2000)	Teacher' lack of knowledge about local organizations, lack of equipment (Scott et al., 2015; Marcombe, 2013; Trexler et al., 2000)
Work in groups (Jeronen et al., 2016)	Training courses help teachers designing outdoor classroom (Nordahl & Johannesson, 2016; Tal & Morag, 2009; Smeds et al. 2015b)	Teachers' personal levels of nature relatedness predicted intention to outdoor teaching (Fägerstam, 2014; Torquati & Ernst, 2013)	Field trips, as complex learning settings, link the environment to the science curriculum (Tal & Morag, 2009)	Children health and safety (Scott et al., 2015; Marcombe, 2013; Trexler et al., 2000)
Multi-sensory learning (Smeds et al., 2015a)	Teachers asked for specific training (Trexler et al., 2000)	Educators need to integrate students' botanic garden experience with school subject knowledge (Zhai, 2012)		Cost and travel time (Harris, 2009; Marcombe, 2013; Scott et al., 2015; Trexler et al., 2000)
Pupils actively participation and agency (Jeronen et al., 2016; Kangas et al., 2017)	Courses recommended in order to provide appropriate supervision in natural environments (Torquati & Ernst, 2013)	Reflection and assuming responsibility: evaluating the process and results of their work (Vare et al., 2019)		
Interdisciplinarity (Vare et al., 2019)	Individual's predisposition to being outdoor influence openness to find value in training (Scott et al., 2015)			

Figure 7 Summary table of the teaching strategies and teachers' competences

Conclusions

The present literature review has pointed out advantages and challenges associated with education experiences carried out in partnership between schools and farms, including both broader educational principles that refers to outdoor education and ESD and topics that are specific to the farm environment. The topic of farm-school relationship has led us to examine, on the one hand, a number of issues that have implications for a broader range of learning environments, including other outdoor settings such as gardens and forests; and on the other hand, learning goals and learning outcomes that are both subject-specific and more generally transversal to environmental and sustainable education. The third key factor we address is related to teachers' competences and teacher education in promoting outdoor education.

Some of the weaknesses and gaps that we have identified had been already pointed out by previous literature reviews and advocate the need to focus future research on the following questions:

- How should teachers and farmers be trained to allow a meaningful and effective learning experience?
- How to consistently incorporate farm experience into school curricula?
- How to detect and assess academic and transversal learning outcomes in a systematic manner?

The present literature review has helped us to define some of the key factors underpinning strong farm/school partnerships and effective outdoor education experiences. These will provide the scaffolding for designing the next steps in the DEMETER project and they include both broader educational principles that apply to outdoor education and ESD in general, and items that are specific to the farm/school partnership.

1. The farm-school partnership could be strengthened by:
- organizing training sessions with both teachers and farmers in order to develop a common language and shared educational goals,
- addressing logistical issues such as time, funds, and seasonality,
- promoting the pedagogical role of the farmer in co-designing the activities.

2. When taking into account the expected learning outcomes, attention should be given to:
- both academic and transversal skills,
- the role played by classroom-based and outdoor experience,
- coherent assessment tools.

3. An effective school-farm co-designed teaching strategy should include:
- well-structured curricular links,
- consideration for students' and teachers' pre and misconceptions, expectations and fears,
- time for hands-on experience, explanation, reconstruction, reflection, and consolidation,
- design and settings to promote inquiry-based learning.

These key points will guide us through the project implementation phase, and especially during our monitoring of teaching practices, and collection of evidence and documentation. This approach will be crucial to training teachers and farmers in designing learning experiences at farms that are meaningful and effective for all the actors involved.

The good practices

The collection of good practices identified in the framework of the DEMETER project is an example of fruitful collaborations between schools and farms. The practices were identified, shared and analyzed by the project team following the definition of a common template. Altogether 15 practices were identified only 11 were chosen as they met the quality criteria identified by the partnership. The first part of the description of each practice is dedicated to its content and how it was planned and implemented. The second part focuses on describing the context and shows why the practice was chosen as an effective example of collaboration between school and farm.

LET'S GO TO THE FARM!

PRIMARY SCHOOL DON BOSCO, MONCUCCO DI VERNATE - IT

TEACHERS: PAOLA CAPITANIO, PAOLA PERETTI
FARMS: CAIELLA (CLASSI 1-2), CAMISANI (CLASSE 3), FIORENTINA (CLASSE 4), ACCADÌ (CLASSE 5)

What? Specific theme-oriented activities

Goal of the activity
To be able to discover, directly on the field, the origin and the production of the products and to get to know from close up experience of rural life.

Description of the type of activity
Incipit: Each class had received a mystery box containing some farm products (flour, honey, jam, rice) and then children were asked some questions in order to discover what they already knew about the origin and the productive process behind the final products.

Introduction: before these activities, more linked to farm, the teachers asked the pupils who is a farmer and what he/she does in order to collect mis-conceptions. From this first inquiry emerged an idealized character, with straw hat and overalls, busy from dawn to dusk working in the fields with low-tech tools.

Let's make jam (first class - 7 years old): Children went to the farm and pick up strawberries in order to transform them in jam and discover the steps of the process.

What is the origin of rice? (third class - 9 y. old): Children went to the farmhouse and discovered, with the help of the farmer, the production process from rice plants to our tables, meeting some discoveries such as types of cultivation, water channels and use of renewable energy.

The teacher's role
The teachers guided the children by flexibly planning what inputs to provide to activate the curiosity and questions of the children, who were then stimulated to look for answers in the field. They have previously established a collaboration with the factors in order to organize the activity and share the objectives.

The children's role
The children have played an active role before going to the farm, during the visit and also on the return, where they reworked the experience.

Farmer/grower/producer's role
The farmers welcomed the classes as privileged witnesses of the children's active search process, answering their questions and guiding their discovery.

Documentation or output to be produced by teachers and children before, during or at the end of the practice.

- First: starting questions that would contain the children's main curiosities about the mysterious objects received and what they knew about it.
- During: active questions, experiments
- Next: verbal and graphic reworking of the themes, discussed in subjects other than science.

Process (step-by-step activities to implement the practice), tools (microscope, ipad, worksheets etc.) and didactic approach (discussion, experiments, problem based questions, brainstorming, role playing etc.).

Let's make jam (first class - 7 years old):
1- startup questions:
We think that the farmer:
-first he/she picks up the fruit in the field
-He/she washes it
-afterwards, they press it with a spoon.
-finally they puts it in the jar.
Is it going to be like that?
To verify our hypotheses, we just have to go to the farmhouse Caiella

2- Experience in the farm:
Phase One: Collect the strawberries in the field.
Step two: wash then and pull the strawberries
Step three: Put the strawberries in a pun and add sugar
phase four: cooking
Step five: transfer to the jars
stage six: taste test

The origin if rice? (third class - 9 y. old):
1- Startup questions:
Children received a packet of rice and a letter.
Dear children, in your opinion, what journey did the product take before it arrived in your hands?
-Please describe it
-Try to draw it.
The children send an email to the farmer asking if their assumptions were right (sowing, growing, harvesting with machinery, processing of rice on the farm and packaging)
2- Experience in the farm:
The children visited the rice fields observing and listening to the different methods of cultivation and learning the great importance of water, channelled into the fields. The class then went to the production area to watch the process of cleaning and packaging

Difficulties (possible weak points, obstacles)

There are not always partners willing to promote challenging learning and teaching processes, either among the factors or among colleagues.
Farm visits were just one for each class.

Potential and Possibilities (follow-up activities)

- Interdisciplinarity (from science and geography to grammar and drama).
- Children also collaborated with all the school's classes in the creation of a year-end theatre show in which they each recounted their own experience. The classes worked on writing a script, screenplay and acting

How? Description of the practice's context

Why is this a good practice?

We think that this is a good practice because it brings out the active role of children in creating a relationship of curiosity and discovery towards the farm and the farmer. A farmer who shows children the commitment and importance of their work by accepting questions and structuring the visit in relation to a project agreed with the teacher.

Where
Pavia (Lombardia region, Italy) countryside

When (in which period of the school year)
April-May

People involved
Teachers, farmers

Timeframe (how many activities/lessons and duration)
4 main phases:
1-Startup questions: 2 activities
2-Farm visit: one full day
3-Follow up activities: 2 hours
4-Show realization: 2 weeks

Learning objectives linked with the national curriculum

- Enhance the experience and knowledge of the students, to anchor new content. In the process of learning the pupil brings a great wealth of experience and knowledge acquired outside the school and through the different media available today and puts into play expectations and emotions, This comes with wealth of information, skills, methods of learning that the didactic action will have to properly recall, explore, and problematize. In this way the student can give meaning to what he is learning.
- The child captures in the world's landscapes of history the progressive transformations made by man on the natural landscape. They realizes that geographical space is a territorial system, consisting of physical elements and anthropogenic relationships linked by connection and / or interdependence.
- The pupil develops attitudes of curiosity and ways of looking at the world that stimulate them to seek out explanations of what they sees happening. Explore the phenomena with a scientific approach. With the help of the teacher, their peers, in autonomous way, observes and describes the course of events, formulates questions, also on the basis of and carry out simple experiments.
- The child clearly explains what they have experienced, using appropriate language. Find information and explanations on problems from various sources (books, internet, adult speeches, etc.) that interest them.

Group and classroom
If it's possible, all classes involved. In each class ensuring that there are one to one and small group work included.

Why did you choose this School–external actors collaboration?

Why have you chosen that farm?
We had chosen some farms in our area, with some we had already collaborated by participating in their workshops, for example the farmhouse Caiella. Others we contacted because we didn't know the owners of the area, apart from one, it happened, that we knew the owners and we involved them in the process, accompanying them in the organization of a visit of a class at their farm.

How did you established contact with the farmer/grower/producer/?
We presented the route to the various farmsteads and involved them. We found that all the owners were keen to support the project.

How did you co-design the activities with the farmer/grower/produce (planning visit, evaluation meeting, etc.)
We proposed the type of collaboration to the various farmhouse, asking them to let us have their products to be discovered by the students before visiting their farm. The material produced by the various classes was then sent to them by the teachers by e-mail before making the visit, so that the pupils' previous and naive knowledge was already clearer to the various factors. After having agreed on a theme, the row of the product analyzed, the content of the activity was managed by the various farmers. The teachers were more involved in the organization of the visit to the young company Accadi, where we had never met with schools.