

Yes, we can recycle with worms!

An integrated, Science Based Project.

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The children's interest in Nature is the perfect starting point to motivate children to learn. In fact, they just need a little motivation to start exploring the world around them. By doing so, they develop language and social skills, self-regulation, observation and analysis skills among many others. A science based project helps children develop a rich and interconnected knowledge about the world around them. The North American Association for Environmental Learning observes that learning about nature emphasizes lifelong skills such as creativity, critical thinking, communication and collaborative learning, all 21st century skills. Children feel comfortable and happy outdoors, they are faced with many opportunities to observe, explore, discover, question and learn. Their curiosity leads them to explore and is the job of us teachers to capitalize this curiosity, guide and encourage them. Environmentalist Rachel Carson, in *Spotlight on Young Children and Nature* (2011), states that: "If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in." She is pointing at us teachers as well as parents, and it is a huge and challenging responsibility. We all know that nowadays children spend most of the time using different technological devices and outdoor exploration is on a secondary place. Furthermore, the National Science Teachers Association (NSTA) states the importance of learning science at very early stage and they point out that it creates an ideal transition for learning in elementary school.

Social and Emotional Learning and Spirituality

When children look after plants, animals and insects or, in this case, the worms, they also practice nurturing behaviors that promote positive relationships with peers and adults. It helps them interact kindly and gently with people and bonds grow stronger within children and adults when they share experiences with nature. Both children and adults find nature fascinating.

There is a belief, according to Mary S Rivkin (2014), that there is a connection of nature and spiritual development. Many authors, including Montessori, Gardner and Fowler, coincide that the power of human spirituality is present since birth, and it plays an important role in developing a whole, well balanced individual and this is one of our most important objectives. They state that nature experiences foster children's spirituality developing feelings of empathy, care, kindness and wonderment. It also nurtures a sense of belonging, respect for self and others and an awareness and appreciation of the unknown.



The great outdoors, the inspiration for our project.

We started our project with a nature walk along the field, on a sunny day, after a very heavy rain. The children (5 year olds) were very curious about the water in the field, so we decided to go walking towards the "lake", as one of them described a flooded part of the field near the railways. The children were very excited about the water we could see from the playground. On our way to the field, one of the girls found a plastic bottle on the grass and suggested picking it up to keep the field clean. When we were close to the water, the children started exploring the grass and to their surprise they found many worms trying to escape from the soggy grass.



One of the boys shouted: "We have to save them or they are going to die!" and so they did! Even the daintiest little girl started to pick up worms from the grass. They were really engaged in this "bailout"! Cata, the girl who had picked up the plastic bottle, suggested putting them inside it to be able to take them to the classroom. Once back in the classroom we put the "survivors" in a jar with soil with the label "worms" in the Science Centre. The worms were safe and the children very happy and enthusiastic!



We took advantage of the children's excitement and interest in the worms we had found and we decided to start an interdisciplinary and cooperative project on vermicomposting. Although the species are different, the ones we saved were earthworms and the ones used for vermicomposting are red worms (*Eisenia foetida*), we thought it was a promising start.

Vermicomposting is a way to produce rich fertilizers in a healthy and inexpensive way which improves our environment. Red worms eat organic waste and transform it into humus which contains reduced levels of contaminants and a lot of nutrients. It is a simple way of recycling organic leftovers. As our children have lunch and a snack at school every day, we thought it was a good idea for them to recycle the waste they make, becoming part of a real life situation where they were going to be able to participate in all the process. From keeping the banana skin they brought for the snack, and cutting it to feed the worms, to collecting the humus to fertilize our vegetable garden.

A month after we started the project we received the visit of an expert on red worms, Mr. Marcelo, who kindly gave us and the children a talk with all the information we needed for our project. The children had the opportunity to ask him many interesting questions.



Objective of the project

Our project addressed two main objectives: to promote environmental awareness by providing opportunities for the children to be part of recycling project in a real life child situation at school and the development of transferable skills in area of communication. All the areas of the curriculum were integrated in this project, it promoted learning in all domains: physical, cognitive, social and emotional. The cognitive domain comprised Science, Maths, Literacy, Art and Language.

Science domain

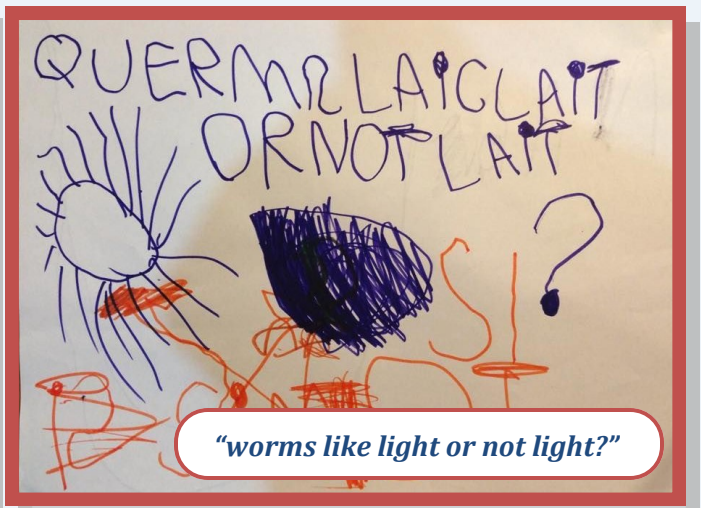
The children's curiosity is the perfect starting point as it leads them to discover and to explore the world around them, guided by our encouragement and help. We followed three major components which, according to Kathleen Conezio and Lucia French in their article in "Young Children and Science" NAYEC (2006), are: **content, processes and attitude**. They state that content is not enough; children should also be encouraged to practice skills of predicting, observing and classifying, hypothesizing, experimenting and communicating, just like scientist do. And this is exactly what they did. However, we have a word to say in relation to the content not being enough in itself, because in our case, the learning of new vocabulary and structures is an added value to the project. The children learn the language in a meaningful context and highly motivated. We took advantage of this hands on experience and the children's enthusiasm to immerse them in the content. It becomes our hidden objective and there is no need to say how children learn when they are enthusiastic and motivated. This makes the content component very critical for our project. Going back to the 2nd component, the process, children need to learn to make predictions, ask questions as these are very important skills young children need to practice, specially when learning a second language. They must be encouraged by the teachers to develop possible theories and to ask questions. They also need to compare ideas, reflect on their findings and share them. And in terms of the children's attitude, this hands on experiences proved to be very effective in terms of motivation.

The experiments: We performed two experiments throughout the project. In order to plan them, we followed a very simple 4 step cycle of scientific reasoning proposed by Conezio and French. This cycle could also be applied to any situation where a problem needs to be solved. When children internalize, it becomes an automatic and powerful guide for solving any problem, essential for a 21st Century.



The 4 steps

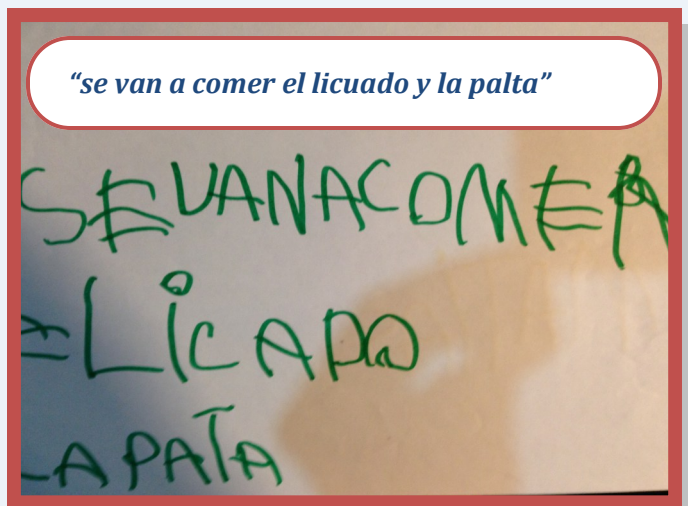
1 Ask and reflect: asking questions such as: What will happen if.....? I wonder what could happen....? I wonder why...? was the starting point of the activity. Children are curious about the world around. However, asking questions is a difficult skill and they need support to make open ended questions. The first experiment was related to the environment preferred by the worms. The research question, in this case suggested by us was: "what will happen if we put the worms in a box partially covered with the lid? Where will they go? To the open part? To the one with the lid?" The research question for the second experiment was suggested by them: "Will they eat the shake we prepared for them (the worms) or will they eat the avocado skin?"



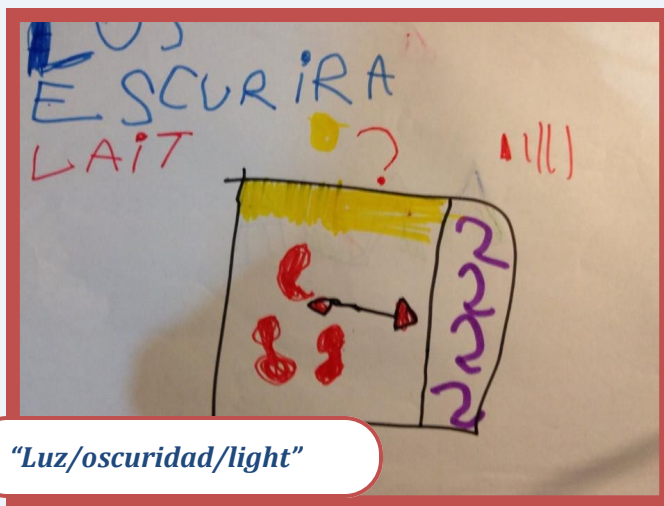
2 Plan and predict: at this point it was necessary to plan how to answer the questions asked and to organize the appropriate activities to find the answers. For the first experiment we decided to put the worms in a box partially covered by the lid. For the second experiment the children suggested putting the banana skin shake we had prepared to feed the worms in one corner of the bin where the worms are kept and in the other corner the avocado. Why did we prepare a shake? Worms don't have teeth so blending the food makes it easier for them to eat it, hence producing humus faster. Besides, the children had fun making the shakes with the blender! The children predicted what was going to happen with the food and they were asked to draw and or write their predictions on paper.



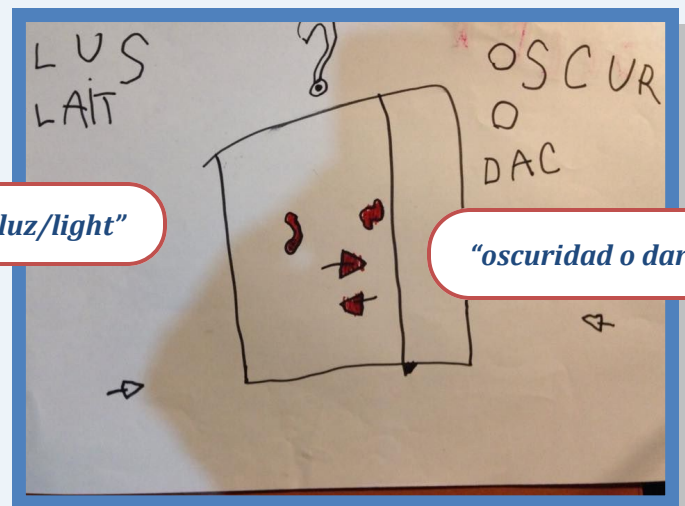
"Palta creo"



"se van a comer el licuado y la palta"



"Luz/oscuridad/light"



"luz/light"

"oscuridad o dark"

3 Act and observe: for the 1st experiment we put one worm in the box and observed what was going on.

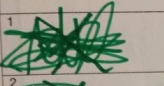
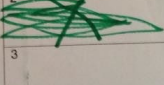


This was done three times. After the third time they decided that worms preferred to be under the lid, in the dark.



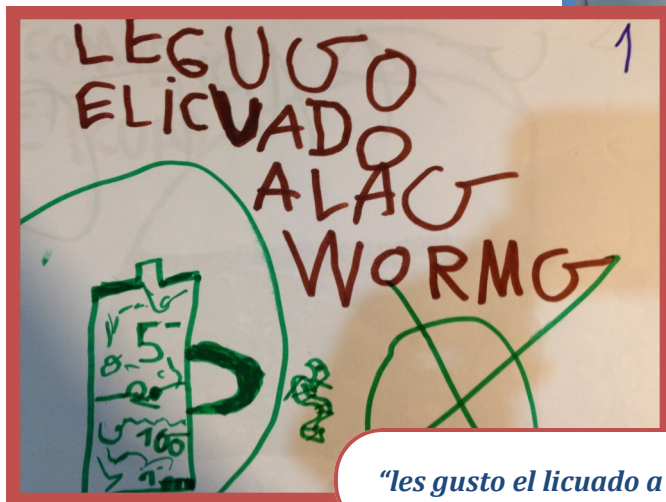
The 2nd experiment took more time as the worms are slow eaters! After a week the worms had eaten the banana skin shake but the avocado skin was still there. The children were very excited and they remembered to check the worms' house every day to see what was happening with the food.

4 Report and reflect: for the 1st experiment the children filled in the following chart and we concluded that worms don't like light. Each time we put a worm in the box, they had to draw a cross in the appropriate box according to where the worm went: Light/no light.

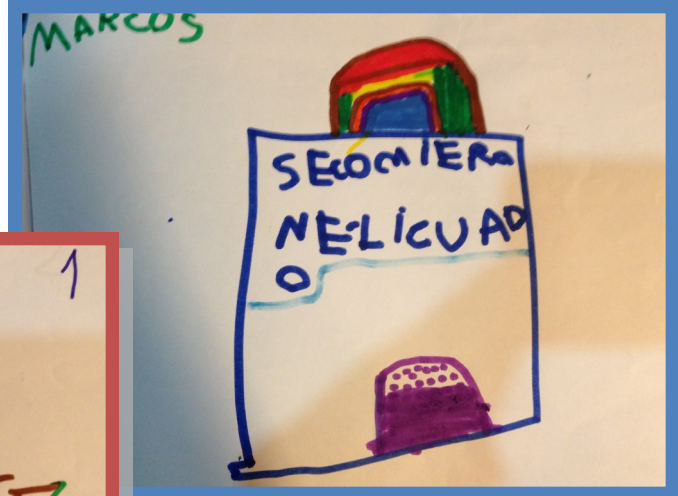
worm	Light 	No light 
1		X
2		X
3		X
4		3

5 ANTS

To report the second experiment the children were asked to write and draw the result of the experiment. Some of them made drawings and some wrote what had happened. Their enthusiasm for writing and drawing was incredible; they worked quietly and at their own level of ability. Some of them preferred writing and some others preferred drawing. In both cases they produced extremely rich pieces of work. The children wrote with a purpose in an authentic situation. This proved, once again, to be of an incredible value.



"les gusto el licuado a los worms"



"se comieron el licuado"

Art activities. We performed many activities in this domain. The children made red worms out of toilet paper rolls. They painted the sections of the toilet paper rolls and threaded them to make the worms. They also made worms with nylon stockings by stuffing them with newspaper and drawing lines on them. Although they learnt that red worms don't have eyes, they insisted on putting eyes on them! Maca explained this controversy by saying "we put eyes on them because they belong to a fairy tale". So this is why our red worms have eyes!



Stuffing the nylon stockings



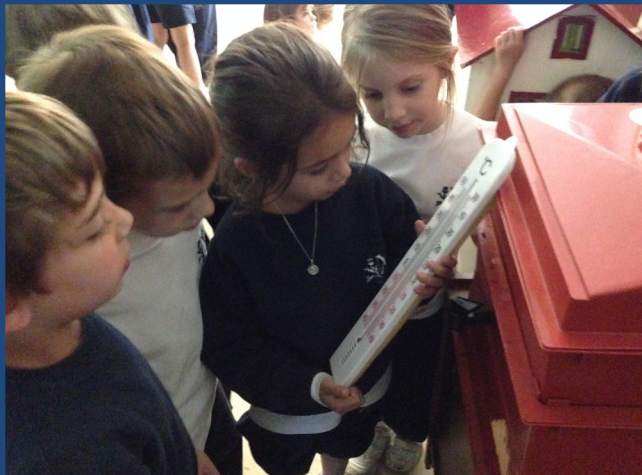
Painting the toilet paper rolls



Final products!



The children had fun painting with mud and colouring two red worms!



Maths activities

The children performed many activities during the project that provided opportunities to practice numeracy and notions of measurement. Using the worms they made out of nylon stockings, they compared their length. They worked with

concepts such as: “this worm is longer/shorter than this one; this is the longest/shortest worm. They also ordered them from short to long and vice versa. In order to control the temperature of the worms’ bin, the children learnt how to read a thermometer. They controlled it often to check that it was between 18 and 20 degrees.



They played a **counting game** using pegs (birds) and worms (pipe cleaner). They played on a small square carpet, which represented the soil. In turns they had to roll a die and they had to pick up the same amount of “worms” as the number they rolled out using the peg. At the end of the game they each had to count the amount of worms caught by the “birds”.



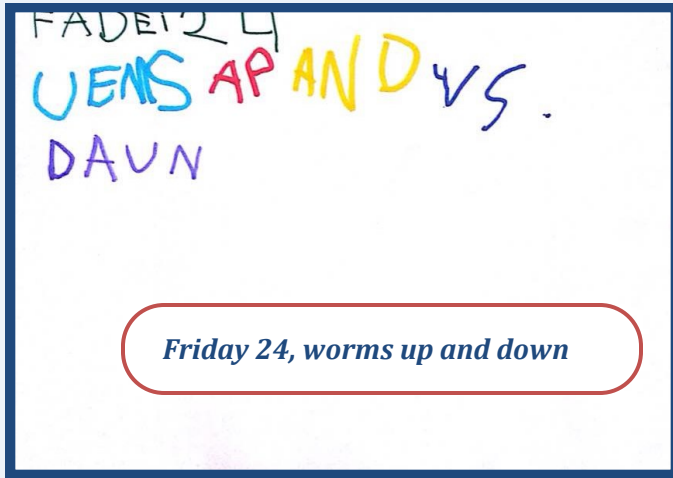
Literacy activities

The children had many opportunities to practice literacy skills in authentic situations as literacy was infused throughout the project, such as in the predictions and results of the experiments which were shown before. They wrote a diary of a worm after listening to the story “Diary of a worm” by Doreen Cronin and Harry Bliss.

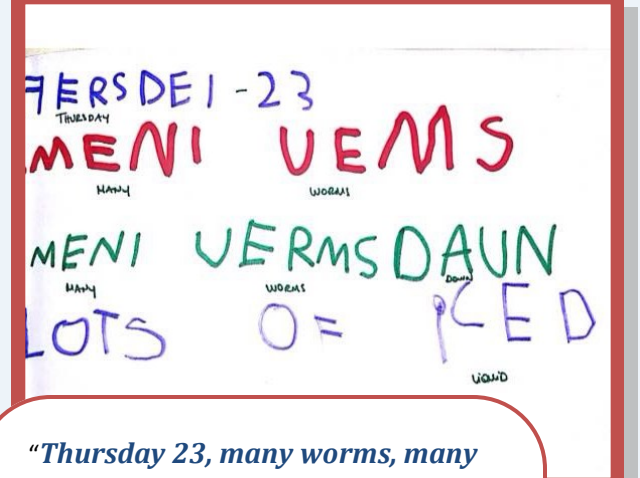
TUSDEY-21
FORUM SUEAP
XDERESVEDAVV
THE REST WERE DOWN
ALOT OF LIQUID
A LOT OF LIQUID

“Tuesday 21, four worms were up. The rest were down. A lot of liquid”





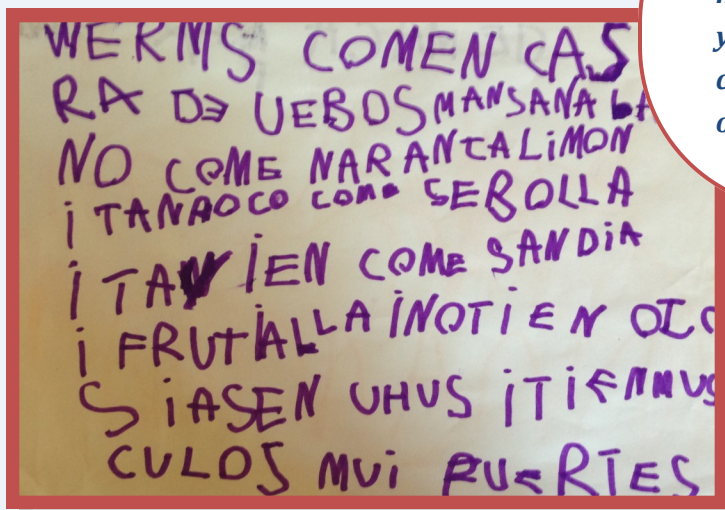
Friday 24, worms up and down



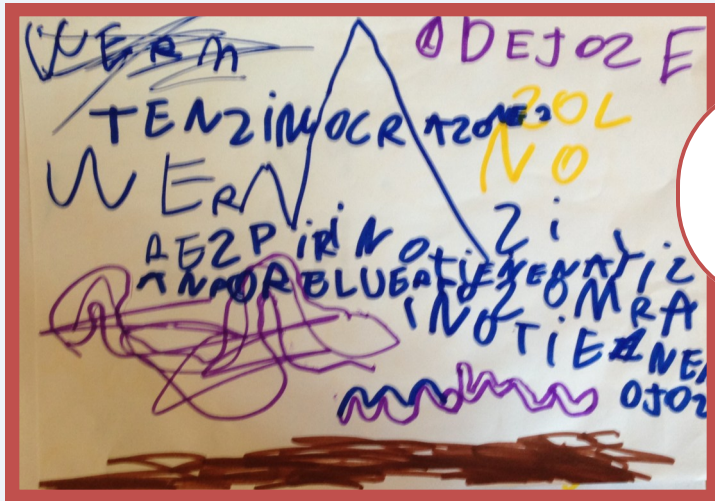
"Thursday 23, many worms, many worms down. Lots of liquid!"

Sharing information

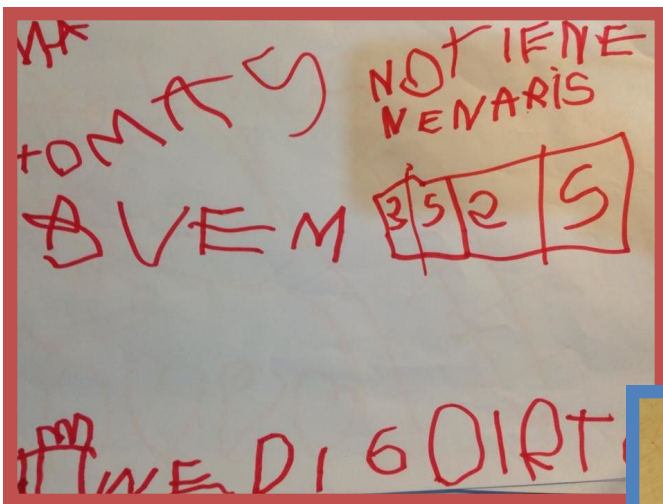
In order to share what they had learnt about red worms with Maca, the waitress of the teachers' dining room, who contributed to our project by giving us the left overs of the kitchen, the children wrote letters telling her all the facts they have learnt about red worms. They worked enthusiastically and with a real purpose and the results were amazing! Then they wrote a label for the container where we kept the food for the worms in the Science Centre.



"worms, comen cascara de huevos, manzana, no comen naranja, limón y tampoco comen cebolla y también comen sandia y frutilla y no tienen ojos y hacen humus y tienen"



*"tienen cinco corazones, sol no/si,
worm, respiran, no tienen ojos,
sombra"*



After **observing** different pictures of red worms on the Ipads, working in small groups, the children drew and "wrote"

everything they wanted about the worms.



Language

As we stated before, learning English is an important objective embedded in all our activities. The children were exposed to new vocabulary and structures. New words such as humus, blender, stretch out and squeeze in (this is the way the worms move) egg shells, banana skin, lettuce, liquid and many more were learnt. They also learnt a poem, a song and a joke which could be seen in the videos attached at the end of the article.

Cooperative games to foster language development, group work and communication skills were played many times throughout the project. Their favorite was "heads together" where the children, divided in groups of four or five children, put their heads together to answer different questions asked by us and sometimes by one of them. Before playing, each group is asked to choose a name with which they all have to agree on. Once they agree on a name, they all sit down in a circle waiting for the question to be asked. Once the question is asked, they put their heads together to discuss the answer. Once they all agree on the correct answer, they have to put their heads up and raise their hands to answer the question. They loved playing this game and it was very effective to help them memorize new vocabulary and structures.

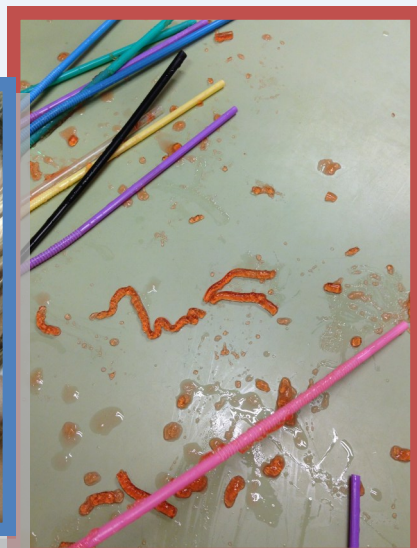


Having fun with worms

The children had fun playing a **wiggle worm relay** in the field: tigers vs. crocodiles! To play the game they made two lines, one of tigers and one of crocodiles. While standing in the line, they had to put their left hand between their legs and the child behind grabbed that hand with their right hand. Then, they ran at a given signal to the other end of the playing area. The first team to arrive 'intact' was the winner.



The made worms with jelly and ate them!



They ate gummy worms and chocolate humus



They dramatized the worms!

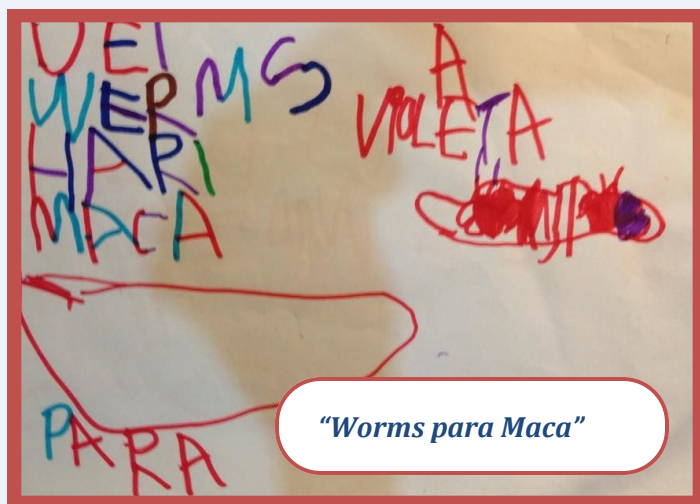


Worms squeeze in and stretch out to move.

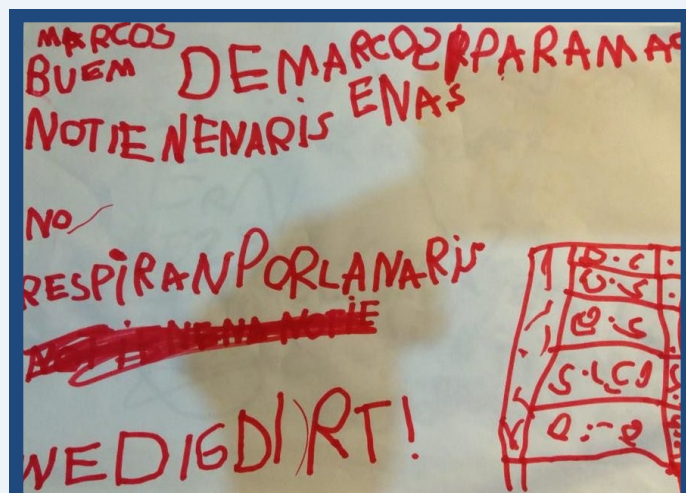


Assessment

Part of our project consisted of visiting the teachers' dining room of the school where Macarena, the waitress, was very kind to help us by keeping some leftovers from the kitchen. The children enjoyed visiting her to look for "food for the worms" to the point they reminded us every day to go and visit Macarena. Luckily Macarena was enthusiast about our project and showed a genuine interest. In order to assess what they had learnt about red worms, we asked them to draw everything they wanted about red worms to share it with Macarena and they agreed enthusiastically. The results of those drawings were amazing and are shown in the Literacy section. Again each child was able to perform at his or her own level of development. Some of the made drawings and some of them wrote some words. Some others preferred to dictate to us what they wanted to write. All the drawings were very helpful in the assessment process as they helped us determine each child's stage of development in both literacy and drawing. It was amazing to see all these very young children burst with enthusiasm when engaged in this meaningful activity.



"Worms para Maca"



Worm, de Marcos para Maca, no tienen nariz, no respiran por la nariz. We dig dirt

We also organized a visit to first grade with the same objective: to share what they had learnt about red worms with the 1st graders. In this case we used pictures of the children performing different activities of the project. We projected them on the white board, while the children, in turns, explained each of the activities to the 1st graders. They had to describe the different activities in English and they really made an effort to accomplish this! They recited a poem about worms and told them a joke about worms, too. You can watch them perform in the videos attached. The 1st graders were delighted to see all the pictures and were eager to visit Kindergarten to see the worms.

Photos taken during the project were also used to assess them, as sometimes while looking at pictures, we get information that was not captured by us at that moment. They allowed us to look at children's expressions on their faces and at the same time allowed the children to revise, reflect, analyze and retell what had happened. They were extremely helpful to share the information about red worms with the 1st graders.

All the drawings made by the children, either with words written by them or dictated to us by them, were of extreme value for the assessment process. They also served the purpose of sharing the information learnt by the children with Macarena, the waitress and with the parents.

Conclusions

We have been taking care of the worms with the children since July and it has become part of our weekly routine. The children worked cooperatively and with genuine enthusiasm. They collaborated by bringing leftovers from the school dining room wrapped in paper towels in their pockets to feed the worms! They also brought eggshells from their homes.

Our students have understood how organic material is broken down through the worms feeding on it, as we have already collected some humus which we used to plant some bulbs in the classroom. We also watered the vegetable garden with the liquid we drained from the worms' "house". The children were and are still very enthusiastic and engaged in the project. The project strongly supported Language, Maths and Literacy in a meaningful context and fostered an array of skills: problem solving, observation, inquiry, reflection, prediction and planning. The visit to 1st grade to share the new knowledge was a success and an excellent resource to assess the children. We also found that taking the children "outdoors" to explore, generated a lot of enthusiasm and at the same time it helped them relax and slow down.

We tried hard to support their learning by providing them with a real opportunity to feel part of a real process, where they were the entrepreneurs, the centre of the learning process.

A short version of our project, the same we shared with 1st graders, is published in the "Green Ribbon Schools" web page from Texas, USA. Green Ribbon Schools is an online community to share ideas, receive mentoring, share lesson plans and ask questions related to impactful sustainability projects. You can visit it here: <http://www.greenribbonschools.org/activity-detail.php?id=3132&resId=4842>

We also shared it on Facebook, in two closed groups: Vermicomposting- Worm Farming and Garden Teachers Project, with whom we were also able to consult many doubts.

References

Amy Shillady's edition, Spotlight on Young Children and Nature, Naeyc Item#294-

Koralek Derry, Colker Laura J, Spotlight on Young Children and Science Naeyc Item#281

RivkinMary S, The Great Outdoors. Advocating for Natural Spaces for Young Children
Naeyc Item# 178

Yong Zhao, World Class Learners: educating Creative and Entrepreneurial Students,
Neasp and Corwin, 2012

Bibliography

<http://thejournal.com/articles/2014/10/28/shifting-science-teaching-toward-the-heuristic.aspx>

<http://www.naeyc.org/files/naeyc/Early%20Childhood%20FINAL%20FINAL%201-30-14%20%281%29.pdf>