Introducing socio-environmental concepts to preschoolers: the case of the 'local-global' connection

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ABSTRACT

With the sustainability of our future under constant threat, it is important for children to realize as soon as possible that local decisions may have global effects. This idea of the 'local-global' connection has been integrated in a learning environment (LE) aiming at supporting preschoolers in enhancing their conceptual understanding about nature, along with their socio-environmental awareness. The LE was designed in the context of early childhood education for sustainability (ECEfS), and implemented in a case study with 30 children. The results, that will be thoroughly discussed, suggest that the learning environment seems to work quite well regarding the socio-environmental target-idea.

KEYWORDS

Early Childhood Education for Sustainability, early biology education, 'possible futures'-approach, design research

RÉSUMÉ

L'avenir durable de la planète est sous menace continuelle et il est important que les enfants prennent conscience le plus rapidement possible que les décisions locales peuvent avoir des répercussions mondiales. Cette idée du "local-global" a été intégrée dans un environnement d'apprentissage qui pourrait aider les enfants d'âge préélémentaire à améliorer leur compréhension conceptuelle de la nature, ainsi que leur conscience socio environnementale. Ceci a été conçu dans le contexte « de l'éducation de la petite enfance au développement durable » et mis en œuvre grâce à une étude de cas avec 30 enfants. Les résultats qui seront soigneusement discutés, suggèrent que l'environnement d'apprentissage semble bien fonctionner au regard de « l'idée cible » socio-environnementale.

MOTS CLÉS

Éducation de la petite enfance au développement durable, éducation précoce en biologie, approche « possibles futures », recherche développementale

INTRODUCTION

The severe environmental, economic and social problems that affect us today seem to put our sustainable future under a constant threat. Education for Sustainability (EfS) should therefore be a focal point from kindergarten to university all over the world (Samuelsson, 2011). An early beginning that would give young children the opportunity to get familiar with socio-environmental issues and the shared-responsibilities, we all have to act for their solution, might contribute to the development of the socio-environmental awareness that is required from modern adults (Davis, 2009; Iliopoulou, 2016). However, the literature seems to reveal a significant gap in research about '*early* childhood EfS' (ECEfS) in particular (Davis, 2009). Despite the progress that *has* been made with investigating EfS at higher educational levels, research with young children still remains limited (Ärlemalm-Hagsér, 2013a; Cutter-Mackenzie & Edwards, 2013; Duhn, 2012; Elliott & Davis, 2018; Reid & Scott, 2006; Smidt, 2018; Spiteri, 2018).

Moreover, it seems reasonable that the development of young children's environmental awareness, which is an integral part of ECEfS, might be combined with, or even facilitated by, the development of basic ecological knowledge as well. 'Biology Didactics' suggests that introducing basic ecological concepts to preschoolers is feasible (Ergazaki & Andriotou, 2010; Leach, Driver, Scott & Wood-Robinson, 1996). The overall question for us then, is whether we could design a learning environment to support young children in developing their socio-environmental awareness and/through their conceptual understanding about nature, and contribute to reducing the research gap about ECEfS.

The literature on ECEfS, although limited as already mentioned, *does* offer theoretical proposals that could be used as 'design principles'. So, we used two of them in order to design a learning environment (LE) that would (a) put children in the position of 'problem seekers', 'problem solvers' and 'action takers' regarding socio-environmental issues (Ärlemalm-Hagsér, 2013b), and (b) give them the perspective of an informed 'future'-choice among different 'possible futures' (Hicks & Holden, 2007). Our LE has been implemented, tested and elaborated within the three research cycles (RC1-3) of our design research. In this paper, we report on the case study we performed in RC3 with the 3rd version of the LE, but we are concerned with just one of its socio-environmental 'target-ideas', the 'local-global' connection.

Inter-connectedness is an inherent feature of nature's function. The webs of interactions within ecosystems are so dense (Krebs, 2008) that it wouldn't be so much of an exaggeration if someone claimed that everything is linked to everything. And this of course has no borders, even if it is not always obvious how. For instance, what do carbon dioxide emissions in Australia have to do with Arctic permafrost and, even more interestingly, what does Arctic permafrost have to do with carbon dioxide concentration in 'Australia's air'? Environmental issues cannot be stopped by borders: the 'local' becomes 'global' and *vice versa*, and all of us need to be aware of this and take it into account in our everyday lives. On the other hand, it has been suggested that young children are quite 'egocentric' (Furth, 2017) and so they could benefit from the chance and support to put themselves and their immediate environment in a broader, more global perspective. In sum, realizing that local problems, decisions or actions, may have global effects, which can possibly loop as well, is of key importance in ECEfS (Palmer & Suggate, 2004). That's why we incorporated this connection in our target-ideas and gave children the chance to explore it in different parts of our LE with different ways, as it will be explained below. The research question we address in this paper is whether preschoolers' understanding about the 'local-global' connection in particular, has improved within the 3nd version of our learning environment (LE3) that was developed and tested in the case study our 3nd research cycle (CS3/RC3).

METHODS

The overview of the study

As already mentioned, we are performing a three-cycle design research (McKenney & Reeves, 2018) in order to develop a learning environment for helping young children enhance both their socio-environmental awareness and ecological understanding. Drawing upon theoretical ideas within the EfS-literature (e.g. the 'possible futures'-approach), as well as upon constructivism, we came up with the 1st version of our learning environment (LE1). This went through the RC1-case study, which means that it was implemented, tested and elaborated to give rise to the LE's 2nd version (LE2). Similarly, LE2 went through the RC2-case study, giving rise to a new version of the learning environment (LE3), which, in turn, went through the RC3-case study. Here we are concerned with the latter, in order to ascertain what happened with children's conceptualization of the 'local-global' connection in particular, after their participation in the 3rd and final version of the learning environment.

LE3 was organized in three parts: (i) the 'intro-part' (LE3-intro), (ii) the 'forest-part' (LE3-A), and (iii) the 'decomposition /recycling-part' (LE3-B). The 'local-global' connection is integrated in the 'forest-part', where children are expected to explore (a) a series of socio-environmental ideas within an overarching scenario about the people of a city, their economic problems and their nearby forest, and (b) a series of ecological ideas that also emerge in the context of this scenario. Both types of target-ideas or learning objectives (LO), are summarized in Table 1.

The 'local-global' connection appears also within the 'intro-part' which precedes the 'forest-part' and includes interactive, guided-discussions about the socio-environmental target-ideas of Table 1, with different 'triggers' and hypothetical scenarios for each. The implementation of LE3, and particularly the first two parts which include the 'local-global' connection, was performed with small groups of preschoolers. Before and after the implementation, children were interviewed individually with regard to the target-ideas.

The participants

The RC3-case study was performed with 30 children (age 4.5-5.5) who were attending a public kindergarten in Patras. The reason we selected them was their teachers' wish to facilitate our study, as well as their parents' and their own agreement to participate. Children were already familiar with educational interactions, since they were attending kindergarten for several months up to that point, and they hadn't participated in formal activities about our target-ideas as their teachers confirmed.

The overview of the LE3-A

Children were divided in six groups of five. Each mixed age and mixed level group took separately part in five, 20-30-minute 'forest-sessions'. These were led by the 1st author of the paper in an 8-week period. The guiding scenario starts with the so-called 'Nice-city' that faces a serious problem of unemployment. The city-council decides to cut down the city's huge forest, so that people who lost their jobs could be employed as wood-cutters or wood-sellers (Hadzigeorgiou, Prevezanou, Kabouropoulou & Konsolas, 2011). This temporarily appealing solution to the *local* problem of unemployment proves to be a *global* disaster in the future. The negative environmental effects it causes strike not only the people of the city, but also the people of other cities and the animals of the ex-forest, who/which were *not* part of the initial problem or its solution anyway. So, recovery plans, as well as preventive ones, need to be implemented with

the contribution of everyone. Activities of several types (story-telling, guided dialogue, brainstorming, puppet-show, role playing) were attached to the scenario, so that both the socio-environmental and ecological target-ideas of Table 1 would be introduced.

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TABLE 1
The learning objectives of LE3-A

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Learning Objectives (LO)		
Socio-environmental ideas	LO1	Future is what is coming later in time
	LO2	Present actions have future effects
	LO3	Humans do not have the right to decide against nature or against fellow humans (equality)
	LO4	Local environmental problems have global effects
	LO5	Everyone needs to act for the environment; individual action is an important part of the collective one
Ecological ideas	LO6	Forests impact the abiotic environment and human life; 'forest function is anti-heat, anti-flood, anti-wind, anti-noise, and pro-air quality
	LO7	A forest is a home to many animals (habitat)
	LO8	Living things are connected in 'food chains'; when one relationship there breaks, the others are affected too

The teaching-learning activities about the idea 'local-global' connection

The idea of the 'local-global' connection is explored within two sessions of the 'forest-part'. The first (session 3: *'The Nice-city in the future': other cities protest')* includes an interactive puppet-show with questions and answers. Representatives of other cities protest to the city-council for the effects they suffer because of the city's decision to cut down the forest for creating new jobs for its unemployed people; and, moreover, they discuss how the 'local' forest cut down triggered these 'global' effects. The second session (session 5: *'Possible solutions': present collective plans for future recovery and prevention')* includes an interactive puppet-show, as well. The city-council and all the 'stake-holders' resume what has been 'globally' caused by a bad 'local decision' and how, and they finally explore together what needs to done and in which ways.

The idea of the 'local-global' connection is also discussed with the 3rd session of the 'intro-part' which is not based on an overarching scenario as already mentioned. The session starts with the Globe as a 'trigger'. Children play with it, they are asked questions about what the Globe represents, as well as how far they think several places they find on the Globe are from each other. They also take part in a brainstorming about whether something that happens at a specific place on the Globe might have effects on another place in a distance, and then they are engaged with three different scenarios. In fact, children are required to think whether (a) the air pollution caused at a specific place on the Globe by a factory that works there, (b) a contagious disease caused at a specific place on the Globe by a mosquito that bites people there, and (c) a drug discovered at a specific place on the Globe by a group of scientists in order to cure a rare but serious illness there, could also affect other, distant places or even the whole Globe, and how. The conclusion to be reached is that 'local' issues become 'global', since nature as well as people, are highly inter-connected despite distance.

The data collection

Individual, semi-structured, interviews, which lasted approximately 20 minutes each, were conducted by the 1st author of the paper at a quiet place of children's school, before and after their participation in the first two parts of LE3. The questions about the target-ideas were integrated in a scenario similar to that of the 'forest-part'. The protocol-scenario starts with a city that faces a serious problem of overpopulation, which makes it very difficult for people to find a house to live in. The city-council decides to cut down the city's forest, so that many new houses could be constructed there. After being asked about whether this present action may be related somehow to the city's future ('present-future' probe), children had to deal with the 'local-global' probe. They were shown a picture representing the city and its forest, as well as other cities that were supposed to be far away (Figure 1).

FIGURE 1

The picture of the 'local-global' probe

And then, they were required to reason about whether and how the other cities may also suffer bad effects from the forest cut-down. The exact articulation of the question depended on what kind of future effects of the forest cut-down were previously recognized by the children. For instance, if the air quality drop was one of them, then the 'local-global' question would go like this: *'You just told me that one of the things that may happen in the future because people cut the city's forest now in order to solve the city's house-problem, is the bad air. Do you think that this problem of bad air will be the city's problem only? Or do you think that other cities may also have bad air because this one cuts down the nearby forest?'*. On the contrary, if the air quality drop wasn't previously mentioned, the interviewer should first suggest it as a possible effect and then proceed to probe children's conceptualization of the 'local-global' connection.

Finally, it is noted that in addition to the pre-/post-interviews, we also gathered data from the implementation of the learning environment. These could highlight the exact ways through which the learning environment may have shaped the understanding of the participants about our target-ideas. So, they seem to better fit in a future paper that will set focus on *how* the learning environment managed to influence children's understanding and not just on *whether* it did so, which is the case with the present paper.

The data analysis

The tape-recorded interviews were transcribed and prepared for coding with NVivo, a 'qualitative data analysis' software. Children's responses were coded as *'naïve', 'transitional'* and *'informed'* according to their level. More specifically, we coded (a) the wrong or 'don't know' responses as *'naïve'*, (b) the correct but incomplete ones as *'transitional'*, and (c) the correct and complete responses as *'informed'*. The coding was simultaneously performed by both authors and cases of disagreement were discussed until consensus was reached. The examples that follow may highlight how we used the categories to code children's responses to the 'local-global' probe.

- 'Naïve': *'Only the city that is near the cut forest will have dirty air. The other cities do not care about this dirty air, because they are far, far away'.*
- 'Transitional': *'The dirty air will go to other cities, too. And the air of other cities will become dirty, too. Because the air is moving and it goes everywhere.'*
- 'Informed': *'The dirty air will go to other cities, too. It doesn't matter that they are far away. They will all have the same problem because the earth is all one, and whatever happens in one place affects the other places, too.'*

RESULTS

According to our results, there seems to be a significant progress concerning children's understanding about the 'local-global' connection. Initially children's understanding seemed to be either 'naïve' or 'transitional', but never 'informed'. On the contrary, after having worked within the learning environment, their understanding about the 'local-global' connection seemed to have changed to either 'informed' or 'transitional'.

More specifically, in the pre-test, 13/30 children gave us 'naïve' responses, whereas 17/30 'transitional' ones (Figure 2). In children's own words:

- *'Well… no. Other cities will be ok after these people cut down their own forest. It is this city's forest and the other cities have nothing to do with it.'* ('naïve' pre-response)
- *'Other cities will have clean air. I don't know why, but they will.'* ('naïve' pre-response)
- *'The air is moving, so the dirty air will go to other cities too.'* ('transitional' pre-response)
- *'The other cities will have some dirty air and some clean air. This is because the dirty air will come to them from the other city, and then it will mix up with their clean air.'* ('transitional' pre-response)

On the other hand, in the post-test, 26/30 children gave us 'informed' responses, whereas only 4/30 'transitional' ones (Figure 1). In children's own words:

- *'The other cities will have dirty air because the dirty air will go everywhere.'* ('transitional post-response)
- *'I think that other cities will have dirty air too. Because if it blows, the air goes everywhere on the earth.'* ('transitional' post-response)
- *'Other cities will have the same problems as this city that cuts its own forest down. This is because the earth is all one thing. So everything that happens to one place of the earth it affects other places too.'* ('informed' post-response)
- *'Of course other cities will also have dirty air, because now the forest is cut down. And when we cut down one forest on the earth, it affects the whole earth. All places are affected and finally they all will have some dirty air.'* ('informed' post-response)

Finally, it should be noted that *all* 30 children who took part in the study, *did* improve their conceptualization of the connection between 'local' and 'global'. More specifically, all 17 children with 'transitional' pre-responses gave 'informed' responses in the post-test. Furthermore, 9/13 children with 'naïve' pre-responses gave 'informed' post-responses in the post-test, whereas the remaining 4/13 gave 'transitional' ones.

FIGURE 2
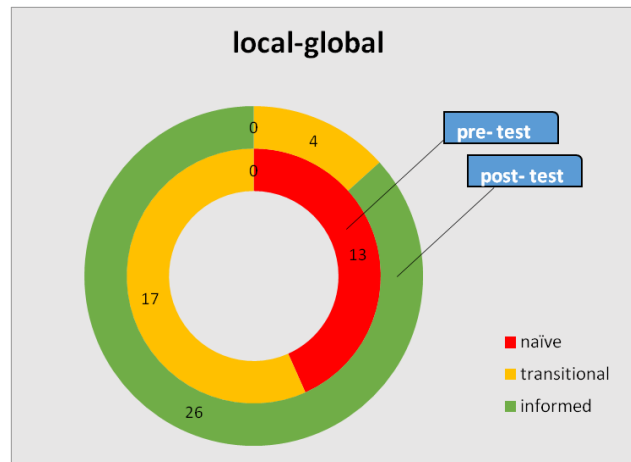
*Frequency of the categories of children's pre/post responses
to the 'local-global' question*

DISCUSSION

According to the results, the 'local-global' teaching-learning activities within the introductory and the 'forest-part' of the 3rd version of our LE seemed to work quite well. The shift of children's responses from lower to higher level categories indicates that the idea that local environmental problems, decisions or actions may have global effects became much clearer to them. This is further supported if we consider that this shift was achieved by *all* 30 children that took part in the study.

It is worth-noticing that in the case study of the previous research cycle (RC2-case study), children's responses to the 'local-global' question hadn't improved as much as we expected. In fact, children gave very few 'informed' post-responses, indicating that we *should* put more emphasis on the specific idea in the next version of the LE. So, when re-designing LE2 to come up with LE3, we tried to enhance and elaborate the ways we introduced the 'local-global' connection by enriching LE3 with related activities and providing more scaffolding when this connection was to be explored. Finally, LE3 did better than LE2 with regard to the specific target-idea, and we think that it may be *both* the extra activity in the new introductory part of LE3 *and* the expansion of children's guided discussions within the two already used activities that made the difference.

In sum, it seems that even very young children can explore and get familiar with demanding socio-environmental ideas such as the connection between 'local' and 'global'. Obviously, ideas of this kind (see Table 1) can contribute to the environmental and social awareness of young children, and so they are of key importance within EfS at all educational

levels. Providing evidence that it is possible to make them work for young children, helps build an argument for the feasibility of an early start with EfS which is absolutely needed nowadays.

REFERENCES

Ärlemalm-Hagsér, E. (2013a). Minds on Earth Hour–a theme for sustainability in Swedish early childhood education. *Early Child Development and Care*, *183*(12), 1782-1795.

Ärlemalm-Hagsér, E. (2013b). Respect for nature - A prescription for developing environmental awareness in preschool. *Center for Educational Policy Studies Journal*, *3*(1), 25-44.

Cutter-Mackenzie, A., & Edwards, S. (2013). Toward a model for early childhood environmental education: Foregrounding, developing, and connecting knowledge through play-based learning. *The Journal of Environmental Education, 44*(3), 195-213.

Davis, J. (2009). Revealing the research 'hole' of early childhood education for sustainability: A preliminary survey of the literature. *Environmental Education Research, 15*(2), 227-241.

Duhn, I. (2012). Making 'place' for ecological sustainability in early childhood education. *Environmental Education Research, 18*(1), 19-29.

Elliott, S., & Davis, J. (2018). Moving forward from the margins: Education for sustainability in Australian early childhood contexts. In G. Reis & J. Scott (Eds.), *International perspectives on the theory and practice of Environmental Education: A reader* (pp. 163-178). Cham: Springer.

Ergazaki, M., & Andriotou, E. (2010). From "forest fires" and "hunting" to disturbing "habitats" and "food chains": Do young children come up with any ecological interpretations of human interventions within a forest? *Research in Science Education, 40*(2), 187-201.

Furth, H. G. (2017). Young children's understanding of society. In H. McGurk (Ed.), *Issues in childhood social development* (pp. 228-256). London: Routledge.

Hadzigeorgiou, Y., Prevezanou, B., Kabouropoulou, M., & Konsolas, M. (2011). Teaching about the importance of trees: A study with young children. *Environmental Education Research*, *17*(4), 519-536.

Hicks, D., & Holden, C. (2007). Remembering the future: What do children think? *Environmental Education Research, 13*(4), 501-512.

Iliopoulou, I. (2016). How young children think they can act for the environment: The case of forest and waste. *Education, 3*(13), 1-15.

Leach, J., Driver, R., Scott, P., & Wood-Robinson, C. (1996). Children's ideas about ecology 2: Ideas found in children aged 5-16 about the cycling of matter. *International Journal of Science Education, 18*(1), 19-34.

McKenney, S., & Reeves, T. C. (2018). *Conducting educational design research*. London: Routledge.

Krebs, C. (2008). *The Ecological World View*. Berkley, USA: University of California Press.

Palmer, J. A., & Suggate, J. (2004). The development of children's understanding of distant places and environmental issues: Report of a UK longitudinal study of the development of ideas between the ages of 4 and 10 years. *Research Papers in Education*, *19*(2), 205-237.

Reid, A., & Scott, W. (2006). Researching education and the environment: Retrospect and prospect. *Environmental Education Research, 12*(3-4), 571-587.

Samuelsson, I. P. (2011). Why we should begin early with ESD: The role of early childhood education. *International Journal of Early Childhood, 43*(2), 103-118.

Smidt, S. (2018). *Early Childhood Education and Care for a shared sustainable world: People, planet and profits*. London: Routledge.

Spiteri, J. (2018). Why we should start early with ESD for Lifelong Learning. In W. Filho, M. Mifsud & P. Pace (Eds.), *Handbook of Lifelong Learning for sustainable development* (pp. 109-128). Cham: Springer.