Experiencing the Urban Space
- A Cognitive Mapping Approach -

도시공간에서의 경험
- 인지맵 접근방식 -

리카르도 가르시아 미라*
Ricardo García Mira

아디나 두미트루**
Adina Dumitru

Abstract

The dependence on cars for urban mobility and the exponential increase in traffic and urban infrastructure to sustain traffic have lead to an encapsulated way of life, where the connection with the natural environment is much more reduced and programmed. In a previous study, a process based on estimating distances showed that children who move around their city by automobile do not appreciate their environment as a spatial continuum, but rather as a series of independent spaces that are reached by automobile or bus, thereby evidencing a different way of conceptualizing urban space in the light of different cognitive structures (Goluboff, García-Mira, and García-Fontán, 2002). The present study is concerned with the process of understanding and knowledge of urban space, and contrasting the cognitive structure of different groups. The implications that this study may have for urban planning are discussed.

Keywords : Sustainability, Cities, Environmental Knowledge, Spatial Knowledge, Cognitive Map
주 요 어 : 지속가능성, 도시, 환경정보, 공간정보, 인지맵

I. Introduction

Environmental psychology, a relatively new yet consolidated field of research when the sustainability paradigm was proposed at the Rio Summit, has concentrated efforts around investigating the impact of human behaviour on the environment and the factors that determine that behaviour. Studies on cognitive aspects such as environmental perception, attitudes, literacy, concern and environmental knowledge have produced very interesting and useful results. Others on more emotional aspects such as place identity and attachment, feelings toward place, values and so on have also produced interesting insights. There is a huge and growing body of research on how to promote education for urban sustainability (García-Mira and Dumitru, 2014).

Research on the factors that determine responsible environmental behaviour has identified different categories of variable that can have an impact. Most of this research has been done with adults and comparatively little research exists on young people's formative experiences and their influence on pro-environmental behaviour, specifically in the urban context. The value-belief-norm theory of environmental behaviour (Stern et al., 1999), emphasized values as a precursor for pro-environmental behaviour in the sense that people need to value the environment for its own sake in order to mobilize for action, both at the individual and the collective level (Chawla and Flanders-Cushing, 2007). Besides the appropriate values, people need to have the knowledge necessary to understand the consequences of their actions on the environment (they need to be literate environmental users) and they have to perceive that social norms promote pro-environmental action.

But people also live and act in very complex systems that afford possibilities for certain types of behaviours and restrict others (Gibson, 1986). For people to act in accordance with their values there need to be possibilities for action inbuilt into the physical and social infrastructures of everyday life. Gardner and Stern (2002) have noted that the structural barriers to action, such as the costs of action in terms of time and resources explain to a large degree when people will act

*정회원(주저자, 교신저자), Professor, Department of Psychology, University of A Coruña, Spain
**정회원, Researcher, Department of Psychology, University of A Coruña, Spain

Corresponding Author: Ricardo García Mira, Department of Psychology, Faculty of Educational Science, University of A Coruña. Campus de Elviña, s/n. 15071-A Coruuña, Spain
E-mail: ricardo.garcia.mira@udc.es

in line with their values and when they will not. Many of these barriers are built into the fabric of our daily lives in the form of political regulations, economic and social practices that become the "normal" way of doing things and are impossible to ignore.

II. Children and the Urban Environment

The increase in the percentage of people living in urban environments and the transformation of the urban space to sustain the massive affluence of people have consequently limited our opportunities for directly experiencing the natural environment, engage in informal environmental learning and develop affective relationships with the natural spaces surrounding us. The traditional urban space was made out of a cluster of activities that people do together surrounded by residences in a density gradient (Shore, 2006). The adult generation today still has a vague memory of these kinds of experiences from their early years, but that might not be the case with the younger generation. Malls have become leisure spaces for young children and adolescents and the increasing complication in organizing our daily life in a complex society has made it more difficult for children to experience the environment and have opportunities for environmental learning. The urban sprawl and a tendency to move to the suburbs and travel big distances to work, the dependence on cars for urban mobility and the exponential increase in traffic and urban infrastructure to sustain traffic have lead to an encapsulated way of life, where the connection with the natural environment is much more reduced and programmed. The extensive work hours and the climate of fear created in the cities have lead to parents restricting children's opportunities for mobility and free play and thus they miss the opportunities to be competent environmental users. (Malone, 2007). Also, busy work schedules have lead to an "adultization" of childhood, a result of the need to occupy children's time with activities that are programmed for them by adults, such as music lessons and sports (Francis and Lorenzo, 2002; Risotto, 2002).

As research has concentrated mostly on pro-environmental behaviour in adults, there is comparatively little information on what kind of experiences contribute to developing more sustainable attitudes, lifestyles and behaviours in children and young people. In their review, Chawla and Flanders-Cushing (2007) identify three bodies of relevant research on young people's environmental behaviour: significant life experiences of people that have proven to have a commitment to environmental action, surveys correlating stated intention to act with other behavioural indicators, and experimental studies comparing the outcomes of different environmental programs.

In what concerns formative experiences as reported by people with a showed commitment to environmental action, different studies in different cultures, working with samples of different ages, gender and socio-economic background, have showed that direct experiences with nature and the environment in general are crucial in the formation of pro-environmental attitudes and in developing commitment to action for the environment. These studies report results that oscillate from half to more than 80% of the respondents mentioning direct nature experiences as important to their future development as activists. As Chawla and Flanders-Cushing (2007) note, the strength of this research lies in the similarity of the findings across cultures and age samples. Direct experience seems to be important in developing both knowledge about the environment and an affective connection with the environment. Also, as research has shown, practicing action skills and developing a sense of competence is also important in acting pro-environmentally, and it seems that knowledge is useless unless complemented by action skills and feelings of competence and self-efficacy (Bandura, 1978, 1986, 1997). As environmental issues become more complex and the need for action more stringent, young people need to be equipped with the necessary skills that can help them make better decisions and choices that would allow for a more sustainable way of life (Joseph et al., 2004; Said, Yahaya and Ahmadun, 2007).

A lot of the responsibility for promoting environmental attitudes and behaviours in children has been placed on the school and on educators. Educators can have an important influence in creating the context and the learning experiences that can lead to conscious and responsible environmental actors. There is now an impressive body of research documenting which types of programs work best, in what contexts, with what duration and what the central ingredients of those programs are. For example, research in environmental education has emphasized enquiry-based learning, experimental learning and action competence as central to improving education for sustainable development (Jensen and Nielsen, 2003; Breiting and Mogensen, 1999). Schools can promote programs that are based on these principles. The average individual though only spends about 3% of his time in school over the course of a lifetime (Falk and Dierking, 2002) and in order to be able to be a competent environmental user, it needs to have other kinds of informal experiences of learning about the environment.

Yet life in modern cities does not allow many opportunities to engage in experimental learning or develop

significant action competence and studies show that informal experiences or free choice experiences are very important in promoting pro-environmental attitudes, raising awareness, improving the level of knowledge about environmental issues, and allowing for the learning of effective action skills in a complex environment (Ballantyne and Packer, 2005). Modern theories of learning emphasize the importance of meaning-making as central to learning (Hein and Alexander, 1998; Schauble, Leinhardt and Martin, 1997) and meaning-making requires active exploration in variety of contexts, over the course of time, some of which needs to be self-driven and based on intrinsic motivations and curiosity.

For children today this active exploration is restricted to specific times and places, tightly controlled by parents. Playing is confined to specific places, normally restricted to the house or to specific neighbourhood areas under supervision. Travelling to school, which used to offer many opportunities to explore and get to know the urban and the natural environment is now mostly done in private vehicles that allow parents to take children to school on their way to work. The dramatic increase in the use of private vehicles in the urban space has become a major problem for local governments, requiring political regulations and intervention. Private car use is an important source of environmental pollution and efforts to reduce it have concentrated on system characteristics, such as changing the urban infrastructure and making public transport faster and more comfortable, as well as on individual characteristics such as raising awareness about the consequences of car use for the environment. Success in these efforts has not been significant. The use of private cars has been reinforced on two levels: on the one hand, travelling by car is associated with higher status and, on the other hand, car use is associated with greater safety for both adults and children, and research shows that concerns of parents for their children's safety in urban environments has been on the rise (Harden, 2000; Francis and Lorenzo, 2002; Bjorklid, 2002). In a study of the influence of environmental concern, attitude towards frugality and perceived ease of behaviour on different types of pro-environmental behaviour, it was shown that neither environmental concern nor a positive attitude towards frugality lead to a reduction in car use, although they were important determinants of other types of environmental behaviour such as reductions in electricity and gas use (Fujii, 2006). It seems that car use is determined by other kinds of factors that are resistant to change in environmental attitudes, concern or level of knowledge. Car use reduction is generally perceived as a difficult behaviour to implement, and this influences the intention to act pro-environmentally by

reducing its use. Parental beliefs that there are no other alternatives, that they live a long way from schools and colleges or that it is convenient to take children to school on their way to work also contribute to this behaviour (Gatersleben, 2002).

There is a well-developed body of research also documenting associations between characteristics of the built environment and the choice of mode of transportation (Cervero and Kockelman, 1997; Frank and Pivo, 1995; Frank et al., 2007). People living in neighbourhood with a higher population density, commercial destinations accessible within a walking distance and good public transportation tend to be more active and walk more than residents in suburban neighbourhoods (Frank et al., 2005). Furthermore, it has been noted that characteristics of the built environment influence walking behaviour alongside underlying preferences for certain types of neighbourhoods and for walking versus taking the car as a mode of transportation (Frank et al., 2007). In a study that controlled for neighbourhood preferences and mode of transport preferences, for example, Frank et al. (2007) found that both attitude predisposition for neighbourhood type and actual characteristics of the built environment impact choice to walk and distances driven.

Parents are also important role models for children. Role-models are important determinants of future environmental attitudes and behaviour, as documented in research on formative experiences of environmental activists and, more generally, in research on learning more broadly conceived (Bandura, 1977, 1986). Parents who drive their children to school model this as a desirable behaviour to their children and this is likely to have a strong influence, alongside that of other role-models (educators), on future environmental commitment and behaviour.

Awareness, knowledge, concern for the environment and skills are also important precursors of environmental commitment and action (Chawla and Flanders-Cushing, 2007). In order to develop relevant knowledge concerning the environment, which in turn would lead to developing commitment toward the environment and to pursue environmentally-friendly behaviour, children need to be able to freely explore their environment. Exploration also leads to positive feelings toward places, which are also known to influence pro-environmental behaviour. Developing a good cognitive map of the urban environment, for example, could be very important in becoming an involved citizen, knowledgeable about issues of sustainability and willing to engage in environmental behaviours, both at an individual and a collective level.

There is little research to date on how children develop an

image of the city depending on the mode of transportation to which they are exposed most frequently. How do children that travel mostly by car differ from those that have the opportunity to walk? What kind of cognitive maps to they develop and what might be the impact of these images of the city on their attitudes, knowledge, feelings and behaviours towards the environment? These are questions that remain largely unanswered to date. A previous study showed that children who move around their city by car do not appreciate their environment as a spatial continuum, but rather as a series of independent spaces that are reached by automobile or bus, thereby showing a different way of conceptualizing urban space than children that walk from one point in the city to another (Goluboff, García-Mira and García-Fontán, 2002).

The present research aims at identifying the differences existing between children who travel around their city by car and those that mostly walk. We are interested in identifying how children gain an understanding and knowledge of the urban space under these different conditions, and how their cognitive structures of easily identifiable places in their home town differ. The present study also analyzes how children of different ages conceptualize urban space and construct cognitive maps of it. Based on our results, we analyze the implications of this research for urban planning and design and we give some recommendations for transforming cities into sustainable environments in which children can freely explore and engage in environmental free play.

III. Cognitive Maps

Cognitive maps have been defined as a person's organized representation of some part of the spatial environment (Downs and Stea, 1977) and as a flexible spatial knowledge acquired in unrewarded situations that permits various routes to a goal (O´Keefe and Nadel, 1978). Cognitive maps are cognitive representations of our surroundings and they are of vital importance in our ability to orient ourselves and act in the environment. Human behaviour in the physical environment is essentially a spatial behaviour that consists of drawing up cognitive maps which are part of our knowledge of the environment and they guide our actions (Stea, Elguea and Blaut, 1997). The ability to build cognitive maps is developed in the early stages of development (Blades et al., 1998), they are influenced by age and experience (Allen, Kirasic, Siegel and Herman, 1979; Devlin, 2001). Also, it is important to note that they involve systematic distortions (Tversky, 1992). Cognitive maps help us navigate in our complex environments and the ability to navigate is an

essential survival skill (Foo et al, 2005). There is a growing body of research on the neural mechanisms that support map formation (Ekstrom et al., 2003; McNamara and Shelton, 2003), and it has been suggested that landmark-based navigation is the primary way of orientation in the environment for human beings (Foo et al., 2005).

In the present study we have used different methods that are described below to investigate the way boys and girls build a cognitive representation of the urban space, depending on the means of transportation they mostly used. We wanted to see if the "bubble-wrapping" of today's youth, as it has been called (Malone, 2007), impacts on their ability to construct adequate representations of the urban environment.

IV. Methodology

The study was done with an initial sample of 100 students with ages comprised between 10-17 years old, living in the city of Corunna, in the Northwest part of Spain. The sample was then reduced to 78 because 22 subjects had provided incomplete or wrong data. Subjects had to complete two tasks for this study. First, they had to draw a personal map on a sheet of paper in which they had to put in as much as they could remember from their journey from home to school. Then, they had to write the name of 15 places in the city that they could remember. This second task was then used as a basis for the third one, in which the most frequently named places were used to construct a matrix with empty cells in which subjects had to write the perceived straight-line distances that they thought existed between each two places.

V. Results

Some of the results have already been reported in previous publications. Multidimensional scaling allowed us to see that the cognitive map of boys and girls who walked to school was close to the real map, while the maps of subjects travelling to school by car were more distant to the real map (Garcia-Mira and Goluboff, 2005), and the statistical difference was significant, showing that this mode of transportation leads to a cognitive distortion in the representation of the urban space. We also found differences between boys and girls in their representations of urban space and also between younger and older subjects, which have been discussed elsewhere. (Garcia-Mira and Goluboff, 2005).

We would like to focus here on the drawings of boys and girls and on the existing differences between them in terms of their cognitive representation of the route to school.
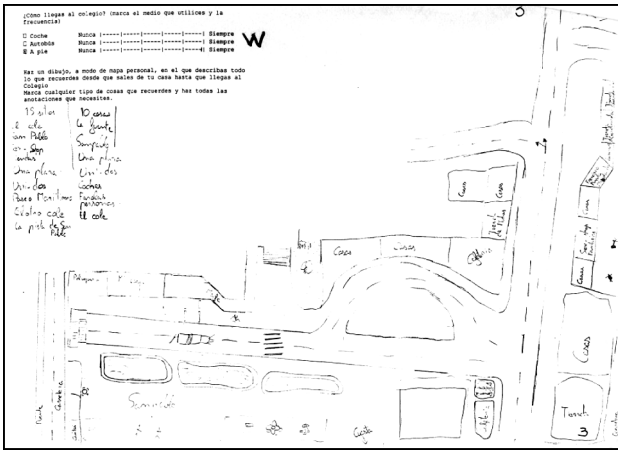
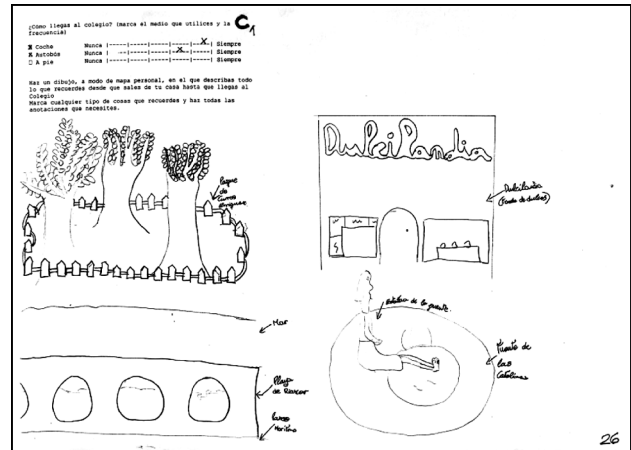Figure 1. *Drawing of a subject who walks to school (1)*

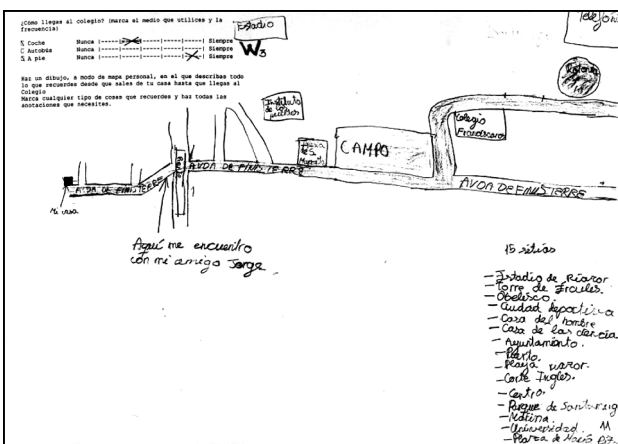Figure 3. *Drawing of a subject who goes to school by car*

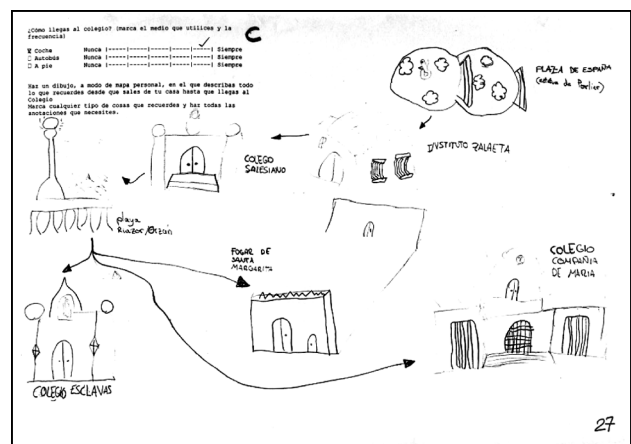Figure 2. *Drawing of a subject who walks to school (2)*

Figure 4. *Drawing of a subject who goes to school by car*

Below, you can see a few examples of drawings with additional comments.

We analysed 78 drawings made by the subjects during the session. Drawings were sorted in the following categories: 1) Boys who travel to school on foot; 2) Girls who travel on foot; 3) Boys who travel by automobile; 4) Girls who travel by automobile.

A second classification was made among 1) Subjects between 10-11 years of age who travel on foot; 2) Subjects between 10-11 years of age who travel by automobile; 3) Subjects between 12-13 years of age who travel on foot; 4) Subjects between 12-13 years of age who travel by automobile; 5) Subjects between 16-17 years of age who travel on foot; 6) Subjects between 16-17 years of age who travel by automobile.

No differences were found when we observed the drawings among different ages or gender. However, when we grouped all these drawings dichotomically in a) drawings of subjects who travel on foot and b) subjects who travel by automobile, we did find interesting differences.

Figure 1 and 2 show two examples (11 and 10 years old, respectively) of the trend found in most of the drawings. We can see how the mental representation of subjects walking to school is characterized by continuity and coherence. We can also see that there is quite a wealth of detail and, as our multidimensional scaling has further confirmed, distances tend to be perceived more accurately.

Figures 3 and 4 are an example of the drawings made by subjects (11 and 13 years old, respectively) who travel by automobile. They show quite a different reality. Subjects who go to school by car tend to have a discontinuous representation of their route and they tend to organize objects in clusters, which are sometimes labelled. Elements of the urban landscape are perceived as separate, as they see these objects from the window of a car. They tend to have less detail than the previous ones and it is likely that route-based navigation would be very difficult for these subjects. Evaluated distances suffer more distortion than in the case of subjects who walk.

It is clear by now that subject's conceptualizations of the

urban space differ depending on the mode of transportation they use. Future research could also concentrate on how the mode of transportation influences feelings toward the urban environment and the subject's sense of personal competence.

VI. A Few Recommendations: Toward Designing More Sustainable Cities

This research has shown us that the types of experience young people have with the urban environment has an impact on their mental representations of urban space. Drawings we have analyzed show that walking to school provides opportunities for subjects to experience the city directly, develop a realistic image of it and get to know it much better than subjects who are driven to school by car. It is easy to imagine and reasonable to think, that walking to school also allows much more opportunities of direct engagement with the natural environment, of natural observation and free enquiry, and also helps develop a sense of personal competence.

Research in Environmental psychology has also established that direct experience is important in developing awareness of the environment and its problems (Uzzell, 2000) and direct experience also leads to positive affect and to a stronger sense of commitment and engagement with the city and its problems, as research on place attachment and place identity has demonstrated (Hernández et al., 2007). Direct contact also allows for the possibility of developing important skills to be able to negotiate freely in the environment (Malone, 2007).

Unstructured play, informal learning and direct experience have all been shown to be very important in raising children that will become adults that are aware of the complexities of the world around them and understand the difficult issues and interdependencies that concern our global environment and might threaten our existence. Human beings are meaning-making creatures and we need to have the opportunity to explore, be curious and have free-choice learning experiences to become actively involved with the problems around us. While these experiences used to be common a few decades ago, they are scarce now due to significant changes in the structuring of our urban environments, changes in our economic and social practices that have lead to longer work schedules, longer distances between homes, the work-place and other important services, and also because of a raising climate of fear among parents.

Previous research has also showed how neighbourhood design influences walking behaviour and distances travelled by car (Frank et al., 2007). Recentralization of cities that show a scattered pattern has been proposed as a solution to the "bubble-wrapping" phenomenon (Malone, 2007) and to the increasing levels of carbon emissions generated by the use of cars (Shore, 2006). Design characteristics that promote walking behaviour, such as accessible and traffic-free paths that can get us easily to important services and objectives, compact neighbourhoods etc, have also been researched and we now have much more information on these issues. Having opportunities to walk in our neighbourhoods has been shown not only to influence environmental sustainability indicators, but also levels of obesity and population health indicators (Frank et al., 2007).

This research also demonstrates a necessity to educate parents about the importance of providing their children with opportunities to engage in free environmental exploration and play. Parents are important role-models that will influence children's attitudes, values, and behaviour towards the environment. And they are also active citizens that can influence government policies on urban design, demanding more spaces where children can play unsupervised, the provision of routes for walking or biking and they can demand neighbourhoods that permit a sustainable way of life.

Children have different spatial needs at different ages (Elsley, 2004) and those needs need to be taken into account when designing neighbourhoods and urban planning policies.

Since the Rio Summit and the formulation of the Agendas 21, there have been great advances in involving communities in environmental and urban-planning decision making. A lot has been written on the benefits of participation (García-Mira et al., 2007, 2012; García-Mira, García-González and Barreiro Rivas, 2008) and on the difficulties and dilemmas associated with it (Rydin and Pennington, 2000). And we now have developed methods to include different social groups in participatory processes and insure they have their voice heard, such as minorities, the elderly and children (Roe, 2007). Yet there are still considerable limitations in the involvement of children and youth in decision-making processes (Chawla and Heft, 2002) and often their voice is not heard and their needs are not taken into account. Although there still is little research on this, we now have some evidence that children feel their voices are not heard in decisions regarding their environment, and their need for their "own" spaces is not respected (Roe, 2007). The need for more research on how the spatial conditions of childhood have changed has already been signalled in the literature (Blinkert, 2004). Although the involvement of children and youth in decision-making might still require a deeper change in societal views, we now have a variety of participatory

methods that we can use to make sure this happens.

As opportunities for free play and outdoor activities are scarcer, the schools become one of the few places where children can still engage in free play activities. School playgrounds are sometimes the only places where parents feel that their children can play safely and field trips and summer camps are the few opportunities children and youth have to enter in direct contact with the natural environment, experience it, and develop awareness of important environmental processes and issues. Visits to important city sites and awareness and involvement in urban issues is also an important tool that educators have in order to promote knowledgeable and responsible citizens that will lead more sustainable lifestyles and demand responsible sustainability policies from their political representatives.

We still have a long way to go to achieve more sustainable cities. It is clear that we need to take children and youth into account when we decide on environmental and urban planning policy, since they will bare the consequences of our actions. And they need to be prepared to face the daunting challenges of climate change.

REFERENCES

1. Allen, G.L., Kirasic, K.C., Siegel, A. W., and Herman, J.F. (1979) Developmental issues in cognitive mapping: the selection and utilization of environmental landmarks. *Child development*, *50*, 1062-1070.

2. Ballantyne, R. and Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: what is the state of the game?. *Environmental Education Research, 11*(3), 281-295.

3. Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.

4. Bandura, A. (1978). Reflections on self-efficacy. *Advances in Behavioral Research and Therapy, 1*(4), 237-269.

5. Bandura, A. (1986). *Social foundations of though and action*. Englewood Cliffs, NJ: Prentice-Hall.

6. Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.

7. Bjorklid, P. (2002). Parental restrictions and children's independent mobility from the perspective of traffic environmental stress. In R. Garcia Mira, J.M. Sabucedo and J. Romay (eds.): *Culture, quality of life and globalization. Proceedings of the 17th Conference of IAPS* (762-763). A Coruña: AGEIP-IAPS.

8. Blades, M., Blaut, J.M., Darvizeh, Z., Elguea, S., Sowden, S., Soni, D., Spencer, C. Stea, D., Surajpaul, R. and Uttal, D. (1998). A cross-cultural study of young children's mapping abilities. *Transnational Institute of British Geographers, 23,* 269-277.

9. Blinkert, B. (2004). Quality of the city for children: chaos and order. *Children, Youth and Environments, 14*(2), 99-112.

10. Breiting, S. and Mogensen, F. (1999). Action comptence and environmental education. *Cambridge Journal of Education, 29*, 349-353.

11. Cervero, R., and Kockelman, K. (1997). Travel demand and the 3DS: Density, diversity, and design. *Transportation Research Part D: Transport and Environment, 2*(3), 199-219.

12. Chawla, L. and Flanders-Cushing, D. (2007). Education for strategic environmental behaviour. *Environmental Education Research*, 13(4), 437-452.

13. Chawla, L. and Heft, H. (2002). Children's competence and the ecology of communities: a functional approach to the evaluation of participation. *Journal of Environmental Psychology, 22*, 201-216.

14. Devlin, A.S. (2001). *Mind and maze: spatial cognition and environmental behaviour.* Westport, CT: Praeger.

15. Downs, R.M. and Stea, D. (1977). *Maps in minds. Reflections on cognitive mapping.* New York: Harper and Row Publishers.

16. Eckstrom, A.D., Kahana, M.J., Caplan, J.B., Fields, T.A., Isham, E.A., Newman, E.L., and Fried, I. (2003). Cellular networks underlying human spatial navigation. *Nature, 425,* 184-187.

17. Elsley, S. (2004). Children's experience of public space. *Children and Society, 18,* 155-164.

18. Falk, J. H. and Dierking, L. D. (2002). *Lessons without limit: how free-choice learning is transforming education.* Walnut Creek, CA: AltaMira Press.

19. Foo, P., Warren, W.H., Duchon, A., and Tarr, M.J. (2005) Do humans integrate routes into a cognitive map? Map-versus landmark-based navigation of novel shortcuts. *Journal of Experimental Psychology: Learning, Memory and Cognition, 31* (2), 195-215.

20. Francis, M. and Lorenzo, R. (2002). Seven realms of children's participation. *Journal of Environmental Psychology, 22,* 157-169.

21. Frank, L.D., Saelens, B.E., Powell, K.E., and Chapman, J.E. (2007). Stepping towards causation: do built environments or neighbourhood and travel preferences explain physical activity, driving and obesity?. *Social Science and Medicine, 65,* 1898-1914.

22. Frank, L. D., Schmid, T., Sallis, J. F., Chapman, J., and Saelens, B. (2005). Linking objective physical activity data with objective measures of urban form. *American Journal of Preventive Medicine, 28*(2S2), 117-125.

23. Frank, L., and Pivo, G. (1995). Impacts of mixed use and density on utilization of three modes of travel: Single-occupant vehicle, transit, and walking. *Transportation Research Record, 1466*, 44-52.

24. Fujii, S. (2006). Environmental concern, attitude toward frugality and ease of behaviour as determinants of pro-environmental behavioural intentions. *Journal of Environmental Psychology, 26,* 262-268.

25. García-Mira, R. and Dumitru, A. (2014). *Urban Sustainability.* A Coruña: Institute for Psychosocial Studies and Research & Deputación Provincial de A Coruña.

26. García-Mira, R. and Goluboff, M. (2005). The perception of urban space from two different viewpoints: pedestrians and automobile passengers. In: García-Mira, R., Uzzell, D.L.,

Real, J.E., Romay, J. (eds.) *Housing, space and quality of life*, Burlington, VT: Ashgate.

27. García-Mira, R.; García-González, C.; Dumitru, A.; and Barreiro-Rivas, XL (2012), The social dimension of forest fires: Risk, responsibility, and participation. En S. Kabisch, A. Kunath, P. Schweizer-Ries, and A. Steinführer (Eds.), Vulnerability, Risks, and Complexity. *Impacts of Global Change on Human Habitats* (pp. 103-119). Cambridge, MA: Hogrefe.

28. García-Mira, R.; García-González, C., and Barreiro Rivas, X.L. (2008). The social perception of the 2006 forest fires in the Northwest region of Spain: Information, trust, education and participation. En: K.H. Kiefer (Ed.), *Applied Psychology Research Trends (pp. 183-210)*. Nueva York, NY: Nova Science Publishers, Inc.

29. García-Mira, R.; Stea, D.; Real, J.E.; Elguea, S., and Coreno, V. (2007). Psychology, participation and environmental policymaking: The case of the Prestige disaster. 21st Century Society. *Journal of the Academy of Social Sciences*, *2*(3), 275-286.

30. Gardner, G. T. and Stern, P. C. (2002). *Environmental problems and human behavior*. Boston, MA: Pearson Custom Publishing.

31. Gatersleben, B. (2002). Sustainable school travel: what is the potential for change? In R. Garcia Mira, J.M. Sabucedo and J. Romay (eds.): *Culture, quality of life and globalization. Proceedings of the 17th Conference of IAPS* (762-763). A Coruña: AGEIP-IAPS.

32. Gibson, J.J. (1986). *The ecological approach to visual perception*. Hilsdale, NJ: Lawrence, Erlbaum & Associates.

33. Goluboff, M., Garcia-Mira, R., and Garcia-Fontan, C. (2002). Percepción del espacio urbano desde la perspective de peatones y pasajeros. In R. Garcia-Mira, J.M. Sabucedo and J. Romay (Eds.) *Psicologia y Medio Ambiente. Aspectos Psicosociales, Educativos y Metodologicos (Psychology and the Environment. Psychosocial, Educational and Methodological Aspects)*, 149-157. A Coruña: AGEIP-IAPS.

34. Harden, J. (2000). There's no place like home: the public/private distinction in children's theorising of risk and safety. *Childhood*, *7*, 34-45.

35. Hein, G. E. and Alexander, M. (1998). *Museums: places of learning*. Washington, DC, American Association of Museums.

36. Hernández, B.; Hildalgo, M.C.; Salazar-Laplace, M.E.; and Hess, S. (2007). Place attachment and place identity in natives and non-natives. *Journal of Environmental Psychology*, *27*(4), 310-319.

37. Jensen, B.B. and Nielsen, K. (2003). Action-oriented environmental education: Clarifying the concept of action. *Journal of Environmental Education Research, 1*, 173-193

38. Joseph, L.A., Victoria E.A., Campbell, A.B. and Louie, R (2004). Teaching students to make better decisions about the environment: lessons from the decision sciences. *Journal of Environmental Education*, *36*(1), 33-44

39. Malone, K. (2007). The bubble-wrap generation: children growing up in walled gardens. *Environmental Education Research*, *13*(4), 513-527.

40. McNamara, T.P. and Shelton, A.L. (2003). Cognitive maps and the hippocampus. *Trends in Cognitive Sciences*, *7*, 333-335

41. O'Keefe, J., and Nadel, L. (1978). *The hippocampus as a cognitive map*. Oxford, England: Oxford University Press.

42. Rissotto, A. (2002). *Projects and policy for childhood in Italy*. Paper presented at the II Congress of Environmental Psychology in Italy. La Sapienza - CNRS University, Italy.

43. Roe, M. (2007). Feeling "secrety": children's views of involvement in landscape decisions. *Environmental Education Research*, *13*(4), 467-485.

44. Rydin, Y. and Pennington, M. (2000). Public participation and local environmental planning: the collective action problem and the potential of social capital. *Local Environment*, *5*(2), 153-169.

45. Said, A.M., Yahaya, N., and Ahmadun, F.R. (2007). Environmental comprehension and participation of Malaysian secondary school students. *Environmental Education Research*, *13*(1), 17-31.

46. Schauble, L., Leinhardt, G. and Martin, L. (1997). A framework for organizing a cumulative research agenda in informal learning contexts. *Journal of Museum Education*, *22*(2-3), 3-7.

47. Shore, W.B. (2006). Land-use, transportation and sustainability. *Technology in Society*, *28*, 27-43

48. Stea, D., Elguea, S. and Blaut, J.M. (1997). Desarrollo del conocimiento del espacio a la escala macroambiental entre niños muy jóvenes. Una investigación transcultural (Development of space knowledge at a macro-environmental scale among very young children. A cross-cultural research). *Revista Interamericana de Psicología/ Interamerican Journal of Psychology*, *31*(1), 141-147.

49. Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., and Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, *6*(2), 81-97.

50. Tversky, B. (1992) Distortions in cognitive maps. *Geoforum*, *23*, 131-138.

51. Uzzell, D. (2000). The psycho-spatial dimension of global environmental problems. *Journal of Environmental Psychology*, *20* (3), 307-318.